

1998-2004



# SERVICE MANUAL

**TRX450S/FM**

FOURTRAX FOREMAN® S/FM

**TRX450ES/FE**

FOURTRAX FOREMAN® ES/FE

## IMPORTANT SAFETY NOTICE

**WARNING**

*Indicates a strong possibility of severe personal injury or death if instructions are not followed.*

**CAUTION:**

*Indicates a possibility of equipment damage if instructions are not followed.*

**NOTE:**

Gives helpful information.

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. It is important to note that this manual contains some warnings and cautions against some specific service methods which could cause **PERSONAL INJURY** to service personnel or could damage a vehicle or render it unsafe. Please understand that those warnings could not cover all conceivable ways in which service, whether or not recommended by Honda, might be done or of the possibly hazardous consequences of each conceivable way, nor could Honda investigate all such ways. Anyone using service procedures or tools, whether or not recommended by Honda, *must satisfy himself thoroughly* that neither personal safety nor vehicle safety will be jeopardized by the service methods or tools selected.



## HOW TO USE THIS MANUAL

This service manual describes the service procedures for the TRX450S/FM and TRX450ES/FE.

Follow the Maintenance Schedule (Section 3) recommendations to ensure that the vehicle is in peak operating condition and the emission levels are within the standards set by the California Air Resources Board.

Performing the first scheduled maintenance is very important. It compensates for the initial wear that occurs during the break-in period.

Sections 1 and 3 apply to the whole vehicle. Section 2 illustrates procedures for removal/installation of components that may be required to perform service described in the following sections.

Section 4 through 23 describe parts of the vehicle, grouped according to location.

Find the section you want on this page, then turn to the table of contents on the first page of the section.

Most sections start with assembly or system illustration, service information and troubleshooting for the section.

The subsequent pages give detailed procedure.

If you are not familiar with this vehicle, read the Technical Features in section 24.

If you do not know the source of the trouble, go to section 25, Troubleshooting.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. HONDA MOTOR CO., LTD. RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION WHATSOEVER. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION. THIS MANUAL IS WRITTEN FOR PERSONS WHO HAVE ACQUIRED BASIC KNOWLEDGE OF MAINTENANCE ON HONDA MOTORCYCLES, MOTOR SCOOTERS OR ATVS.












HONDA MOTOR CO., LTD.  
SERVICE PUBLICATION OFFICE

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## SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it would be explained specifically in the text without the use of the symbols.

	Replace the part(s) with new one(s) before assembly.
	Use recommended engine oil, unless otherwise specified.
	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1 : 1).
	Use multi-purpose grease (Lithium based multi-purpose grease NLGI #2 or equivalent).
	Use molybdenum disulfide grease (containing more than 3 % molybdenum disulfide, NLGI #2 or equivalent). Example: Molykote® BR-2 plus manufactured by Dow Corning, U.S.A. Multi-purpose M-2 manufactured by Mitsubishi Oil, Japan
	Use molybdenum disulfide paste (containing more than 40 % molybdenum disulfide, NLGI #2 or equivalent). Example: Molykote® BR-2 plus, manufactured by Dow Corning, U.S.A. Honda Moly 60 (U.S.A. only) Rocol ASP manufactured by Rocol Limited, U.K. Rocol Paste manufactured by Sumico Lubricant, Japan
	Use silicone grease.
	Apply a locking agent. Use a middle strength locking agent unless otherwise specified.
	Apply sealant.
	Use DOT 3 or DOT 4 brake fluid. Use the recommended brake fluid unless otherwise specified.
	Use Fork or Suspension Fluid.



# 1. GENERAL INFORMATION

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## GENERAL SAFETY

### CARBON MONOXIDE

If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area.

#### WARNING

*The exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death.*

Run the engine in an open area or with an exhaust evacuation system in an enclosed area.

### GASOLINE

Work in a well ventilated area. Keep cigarettes, flames or sparks away from the work area or where gasoline is stored.

#### WARNING

*Gasoline is extremely flammable and is explosive under certain conditions. KEEP OUT OF REACH OF CHILDREN.*

### HOT COMPONENTS

#### WARNING

*Engine and exhaust system parts become very hot and remain hot for some time after the engine is run. Wear insulated gloves or wait until the engine and exhaust system have cooled before handling these parts.*

### USED ENGINE OIL

#### WARNING

*Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil. KEEP OUT OF REACH OF CHILDREN.*

### BRAKE FLUID

#### CAUTION:

*Spilling fluid on painted, plastic or rubber parts will damage them. Place a clean shop towel over these parts whenever the system is serviced. KEEP OUT OF REACH OF CHILDREN.*

### BRAKE DUST

Never use an air hose or dry brush to clean the brake assemblies. Use an OSHA-approved vacuum cleaner or alternate method approved by OSHA, designed to minimize the hazard caused by airborne asbestos fibers.

#### WARNING

*Inhaled asbestos fibers have been found to cause respiratory disease and cancer.*

## GENERAL INFORMATION

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### BATTERY HYDROGEN GAS & ELECTROLYTE

#### WARNING

- *The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging.*
- *The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.*
  - *If electrolyte gets on your skin, flush with water.*
  - *If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.*
- *Electrolyte is poisonous.*
  - *If swallowed, drink large quantities of water or milk and follow with milk of magnesia or vegetable oil and call a physician. KEEP OUT OF REACH OF CHILDREN.*

## SERVICE RULES

1. Use genuine HONDA or HONDA-recommended parts and lubricants or their equivalents. Parts that don't meet HONDA's design specifications may cause damage to the vehicle.
2. Use the special tools designed for this product to avoid damage and incorrect assembly.
3. Use only metric tools when servicing the vehicle. Metric bolts, nuts and screws are not interchangeable with English fasteners.
4. Install new gaskets, O-rings, cotter pins, and lock plates when reassembling.
5. When tightening bolts or nuts, begin with the larger diameter or inner bolt first. Then tighten to the specified torque diagonally in incremental steps unless a particular sequence is specified.
6. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
7. After reassembly, check all parts for proper installation and operation.
8. Route all cable and harness routing as shown on pages 1-21 through 1-29 Cable and Harness Routing.

## MODEL IDENTIFICATION

TRX 450S/FM :

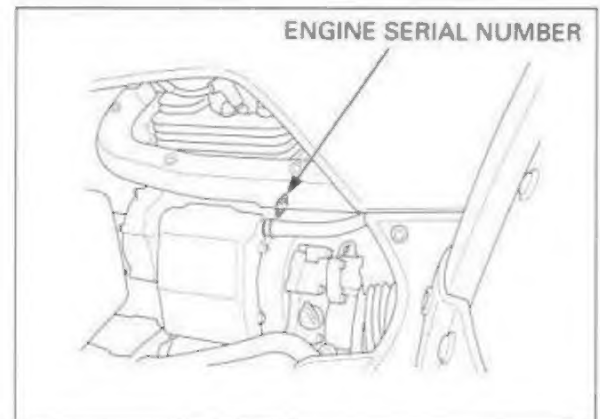


TRX 450ES/FE :



FRAME SERIAL NUMBER

The frame serial number is stamped on the front of the frame.



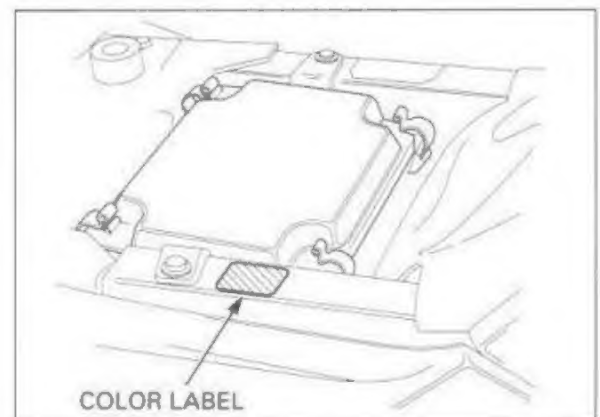
ENGINE SERIAL NUMBER

The engine serial number is stamped on upper side of the rear crankcase viewed from the left side.



CARBURETOR NUMBER

The carburetor identification numbers are stamped on the left side of the carburetor body as shown.



COLOR LABEL

The color label is attached to the frame under the seat as shown. When ordering color-coded parts, always specify the designated color code.



## GENERAL INFORMATION

### SPECIFICATIONS

[ ] : '98 - '01: TRX450ES  
After '01: TRX450FE

GENERAL			
	ITEM		SPECIFICATION
DIMENSIONS	Overall length	('98 - '01) (After '01)	1,961 mm (77.2 in) 1,963 mm (77.3 in)
	Overall width	('98 - '01) (After '01)	1,156 mm (45.5 in) 1,151 mm (45.3 in)
	Overall height		1,144 mm (45.0 in)
	Wheelbase	('98 - '01) (After '01)	1,271 mm (50.0 in) 1,274 mm (50.2 in)
	Front tread	('98 - '01) (After '01)	912 mm (35.9 in) 910 mm (35.8 in)
	Rear tread		905 mm (35.6 in)
	Seat height	('98 - '01) (After '01)	860 mm (33.9 in) 854 mm (33.6 in)
	Footpeg height	('98 - '01) (After '01)	327 mm (12.9 in) [333 mm (13.1 in)] 329 mm (13.0 in) [336 mm (13.2 in)]
	Ground clearance	('98 - '01) (After '01)	192 mm (7.6 in) 196 mm (7.7 in)
	Dry weight	('98 - '01) (After '01)	260 kg (573 lbs) [266 kg (586 lbs)] 264 kg (582 lbs) [270 kg (595 lbs)]
	Curb weight	('98 - '01) (After '01)	270 kg (595 lbs) [276 kg (608 lbs)] 274 kg (604 lbs) [280 kg (617 lbs)]
	Maximum weight capacity		220 kg (485 lbs)
FRAME	Frame type		Double cradle
	Front suspension		Double wish-bone
	Front wheel travel		150 mm (5.91 in)
	Front damper		Double tube
	Rear suspension		Swingarm
	Rear wheel travel		150 mm (5.91 in)
	Rear damper		Double tube
	Front tire size		AT 25 X 8-12 ★★
	Rear tire size		AT 25 X 10-12 ★★
	Front rim size		12 X 6.0 AT
	Rear rim size		12 X 7.5 AT
	Tire brand (DUNLOP) FR/RR		KT401C/ '98 - '01: KT405C, After '01 KT128
	Front brake		Hydraulic drum brake
	Rear brake		Mechanical drum brake
	Toe		Toe-out : 35 mm (1-3/8 in)
	Caster angle		3°
	Camber angle		0.1°
	Trail length		7 mm (9/32 in)
	Fuel tank capacity		12.0 ℓ (3.18 US gal, 2.64 Imp gal)
	Fuel tank reserve capacity		2.7 ℓ (0.71 US gal, 0.59 Imp gal)

## GENERAL (Cont'd)

ITEM		SPECIFICATION
ENGINE	Bore and stroke	90.0 × 68.0 mm (3.54 × 2.68 in)
	Displacement	432.6 cm <sup>3</sup> (26.40 cu-in)
	Compression ratio	8.5 : 1
	Valve train	Overhead valve
	Intake valve opens	6° BTDC
	Intake valve closes	45° ABDC
	Exhaust valve opens	36° BBDC
	Exhaust valve closes	10° ATDC
	Lubrication system	Forced pressure and wet sump
	Oil pump type	Trochoid
	Cooling system	Air cooled
	Air filtration	Oiled double urethane
	Crankshaft type	Unit type, two main journals
	Engine weight	(TRX450S/FM) 50.2 kg (110.7 lbs)
		(TRX450ES/FE) 52.2 kg (115.1 lbs)
	Cylinder arrangement	Single cylinder, longitudinally installed
CARBURETOR	Carburetor type	CV (Constant Vacuum) type
	Throttle bore	32.0 mm
DRIVE TRAIN	Clutch system	Centrifugal & multi-plate, wet
	Clutch operation system	Automatic
	Transmission	Constant mesh, 5-speed with reverse
	Primary reduction	2.103 (61/29)
	Secondary reduction	2.100 (42/20)
	Final reduction	Front ('98 - '01) 3.153 (41/13)
		(After '01) 3.231 (42/13)
	Gear ratio	Rear 3.153 (41/13)
		1st 4.083 (49/12)
		2nd 2.388 (43/18)
		3rd 1.608 (37/23)
		4th 1.178 (33/28)
		5th 0.848 (28/33)
	Gearshift pattern	Reverse 4.781 (34/12 X 27/16)
		Left foot operated return system R - N - 1 - 2 - 3 - 4 - 5
ELECTRICAL	Ignition system	DC - CDI
	Starting system	Starter motor and emergency recoil starter
	Charging system	Triple phase output alternator
	Regulator/rectifier	SCR shorted/triple phase full-wave rectification
	Lighting system	Battery

## GENERAL INFORMATION

Unit: mm (in)

Unit: mm (in)

LUBRICATION SYSTEM		STANDARDS	SERVICE LIMIT
ITEM			
Engine oil capacity	At draining	2.0 ℓ (2.10 US qt, 1.76 Imp qt)	—
	At disassembly	2.7 ℓ (2.84 US qt, 2.38 Imp qt)	—
	At oil filter change	2.1 ℓ (2.21 US qt, 1.85 Imp qt)	—
Recommended engine oil		HONDA GN4 4-stroke oil or equivalent motor oil API service classification SF or SG	—
Oil pump rotor	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.21 (0.006 – 0.008)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.11 (0.004)

FUEL SYSTEM			
ITEM		SPECIFICATIONS	
Carburetor identification number		'98 – '01:	VE93A
		After '01:	VE93C
Main jet	Initial		#130
	High altitude setting		#120
Slow jet			#45
Jet needle clip position			3rd groove from top
Pilot screw	Initial opening		2 – 5/8 turns out
	High altitude setting		2 – 5/8 turns out
Float level			18.5 mm (0.73 in)
Engine idle speed			1,400 ± 100 rpm
Throttle lever free play			3.0 – 8.0 mm (1/8 – 5/16 in)
Starting enrichment (SE) valve distance			10 – 11 mm (0.39 – 0.43 in)



Unit: mm (in)

Unit: mm (in)

CYLINDER HEAD/VALVES/CAMSHAFT				
ITEM			STANDARDS	SERVICE LIMIT
Cylinder compression	Decompressor effected		539 – 834 kPa (5.5 – 8.5 kgf/cm², 78 – 121 psi) at 450 rpm	—
	Decompressor not effected		1,226 – 1,442 kPa (12.5 – 14.5 kgf/cm², 178 – 206 psi) at 450 rpm	—
Valve, Valve guide	Valve clearance	IN	0.15 (0.006)	—
		EX	0.15 (0.006)	—
	Valve stem O.D.	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.45 (0.215)
		EX	5.455 – 5.470 (0.2148 – 0.2154)	5.43 (0.214)
	Valve guide I.D.	IN	5.500 – 5.512 (0.2165 – 0.2170)	5.525 (0.2175)
		EX	5.500 – 5.512 (0.2165 – 0.2170)	5.525 (0.2175)
	Stem to guide clearance	IN	0.010 – 0.037 (0.0004 – 0.0015)	0.12 (0.005)
		EX	0.030 – 0.057 (0.0012 – 0.0022)	0.14 (0.006)
Valve seat width		1.2 (0.005)	1.5 (0.06)	
Valve spring free length	Inner		36.85 (1.451)	35.84 (1.411)
	Outer		41.67 (1.641)	40.42 (1.591)
Rocker arm/shaft	Rocker arm I.D.		12.000 – 12.018 (0.4724 – 0.4731)	12.05 (0.474)
	Rocker arm shaft O.D.		11.964 – 11.984 (0.4710 – 0.4718)	11.92 (0.469)
	Rocker arm to shaft clearance		0.016 – 0.054 (0.0006 – 0.002)	0.08 (0.003)
Camshaft and cam follower	Cam lobe height	IN	36.4291 – 36.4291 (1.43421 – 1.44051)	36.25 (1.427)
		EX	36.2670 – 36.4270 (1.42783 – 1.43131)	36.10 (1.421)
	Cam follower O.D.	IN/EX	22.467 – 22.482 (0.8845 – 0.8851)	22.46 (0.884)
	Cam follower bore O.D.	IN/EX	22.510 – 22.526 (0.8862 – 0.8868)	22.54 (0.887)
	Cam follower to bore clearance		0.028 – 0.059 (0.0011 – 0.0023)	0.07 (0.003)

Unit: mm (in)

Unit: mm (in)

CYLINDER/PISTON				
ITEM			STANDARDS	SERVICE LIMIT
Cylinder	I.D.		90.00 – 90.01 (3.543 – 3.544)	90.10 (3.547)
	Taper		—	0.10 (0.004)
	Out of round		—	0.10 (0.004)
	Warpage		—	0.10 (0.004)
Piston, piston rings, piston pin	Piston mark direction		"IN" mark facing toward the intake side	
	Piston O.D.		89.945 – 89.965 (3.5411 – 3.5419)	89.90 (3.539)
	Piston O.D. measurement point		10 mm (0.4 in) from bottom of skirt	
	Piston pin bore I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.08 (0.751)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	Piston-to piston pin clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.12 (0.039)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0011 – 0.0024)	0.09 (0.004)
		Second	0.015 – 0.45 (0.0006 – 0.0018)	0.09 (0.004)
	Piston ring end gap	Top	0.015 – 0.30 (0.006 – 0.012)	0.5 (0.02)
		Second	0.300 – 0.450 (0.012 – 0.018)	0.6 (0.02)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	—
Cylinder-to-piston clearance			0.035 – 0.056 (0.0014 – 0.0022)	0.10 (0.004)
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.7508)
Connecting rod-to piston pin clearance			0.020 – 0.047 (0.0008 – 0.0019)	0.10 (0.004)

## GENERAL INFORMATION

Unit: mm (in)

CLUTCH/GEARSHIFT LINKAGE			
ITEM		STANDARDS	SERVICE LIMIT
Change clutch	Spring free length	32.1 (1.26)	31.0 (1.22)
	Disc thickness	2.62 - 2.78 (0.103 - 0.109)	2.3 (0.09)
	Plate warpage	—	0.20 (0.008)
	Clutch outer guide	O.D.	27.959 - 27.980 (1.1007 - 1.1016)
		I.D.	22.000 - 22.021 (0.8661 - 0.8670)
	Mainshaft O.D at outer guide	21.972 - 21.993 (0.8650 - 0.8659)	21.93 (0.863)
Centrifugal clutch	Drum I.D.	140.0 - 140.2 (5.51 - 5.52)	140.4 (5.53)
	Weight lining thickness	3.0 (0.12)	2.0 (0.08)
	Clutch spring height	3.1 (0.12)	2.95 (0.116)
	Clutch weight spring free length	21.6 (0.85)	22.5 (0.89)
Primary drive gear	I.D.	27.000 - 27.021 (1.0630 - 1.0638)	27.05 (1.065)
	Crankshaft O.D. at drive gear	26.959 - 26.980 (1.0614 - 1.0622)	26.93 (1.060)

Unit: mm (in)

**CRANKSHAFT/TRANSMISSION**

ITEM				STANDARDS	SERVICE LIMIT
Crankshaft, connecting rod	Side clearance		0.05 – 0.65 (0.002 – 0.026)		0.80 (0.031)
	Radial clearance		0.006 – 0.018 (0.0002 – 0.0007)		0.05 (0.002)
	Runout		—		0.05 (0.002)
Transmission	Gear I.D.	M4	25.000 – 25.021 (0.9843 – 0.9851)		25.05 (0.986)
		M5	20.000 – 20.021 (0.7874 – 0.7882)		25.05 (0.986)
		C1, C2, C3	28.020 – 28.041 (1.1031 – 1.1040)		28.07 (1.105)
		CR	28.021 – 28.041 (1.1032 – 1.1040)		28.07 (1.105)
		Reverse idle	18.000 – 18.021 (0.7087 – 0.7095)		18.05 (0.711)
	Shaft O.D.	M4	21.959 – 21.980 (0.8645 – 0.8654)		21.93 (0.863)
		M5	16.983 – 16.994 (0.6686 – 0.6691)		16.95 (0.667)
		Reverse idle	13.966 – 13.984 (0.5498 – 0.5506)		13.93 (0.548)
	Gear bushing	C1 O.D.	27.984 – 28.005 (1.1017 – 1.1026)		27.93 (1.100)
		C2 O.D.	27.979 – 28.000 (1.1015 – 1.1024)		27.93 (1.100)
		CR O.D.	27.979 – 28.000 (1.1015 – 1.1024)		27.93 (1.100)
		M4	I.D.	22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
			O.D.	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
		M5	I.D.	17.016 – 17.034 (0.6699 – 0.6706)	17.06 (0.672)
			O.D.	19.966 – 19.984 (0.7861 – 0.7868)	19.93 (0.785)
		R	I.D.	14.000 – 14.025 (0.5515 – 0.5522)	14.05 (0.553)
			O.D.	17.966 – 17.984 (0.7073 – 0.7080)	17.93 (0.706)
	Gear-to-bushing clearance	M4	0.020 – 0.062 (0.0008 – 0.0024)		0.10 (0.004)
		M5	0.016 – 0.055 (0.0006 – 0.0022)		0.10 (0.004)
		C1	0.015 – 0.057 (0.0006 – 0.0022)		0.10 (0.004)
		C2	0.020 – 0.062 (0.0008 – 0.0024)		0.10 (0.004)
		CR	0.020 – 0.062 (0.0008 – 0.0024)		0.10 (0.004)
		C3	0.015 – 0.057 (0.0006 – 0.0022)		0.10 (0.004)
		Reverse idle	0.016 – 0.055 (0.0006 – 0.0022)		0.10 (0.004)
	Bushing-to-shaft clearance	M4	0.020 – 0.062 (0.0008 – 0.0024)		0.10 (0.004)
		M5	0.022 – 0.051 (0.0009 – 0.0020)		0.10 (0.004)
		Reverse idle	0.016 – 0.059 (0.0006 – 0.0023)		0.10 (0.004)
Shift fork, shaft	Fork	I.D.	13.000 – 13.021 (0.5118 – 0.5126)		13.04 (0.513)
		Claw thickness	4.93 – 5.00 (0.194 – 0.197)		4.50 (0.177)
	Fork shaft O.D.	12.966 – 12.984 (0.5105 – 0.5112)		12.96 (0.510)	



## GENERAL INFORMATION

FRONT WHEEL/SUSPENSION/STEERING			Unit: mm (in)
ITEM	STANDARDS		SERVICE LIMIT
Minimum tire tread depth			4 (0.16)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	
Tie-rod-distance between the ball joints	369 ± 1.0 (14.5 ± 0.04)		
Toe	Toe out : 35 ± 15 mm (1-3/8 ± 9/16 in)		

REAR WHEEL/SUSPENSION			Unit: mm (in)
ITEM	STANDARDS		SERVICE LIMIT
Minimum tire tread depth			4 (0.16)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	

BRAKES			Unit: mm (in)
ITEM	STANDARDS		SERVICE LIMIT
Front brake	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Lining thickness	4.0 (0.16)	2.0 (0.08)
	Brake panel warpage		0.4 (0.02)
	Brake panel seal lip wear		0.5 (0.02)
	Water seal lip length	22.0 (0.87)	20.0 (0.79)
	Master cylinder I.D.	14.000 - 14.043 (0.5512 - 0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957 - 13.984 (0.5495 - 0.5506)	13.945 (0.5490)
	Wheel cylinder I.D.	19.050 - 19.102 (0.7500 - 0.7520)	19.12 (0.753)
	Wheel cylinder piston O.D.	18.997 - 19.030 (0.7479 - 0.7492)	18.81 (0.741)
Rear brake	Drum I.D.	160 (6.30)	161.0 (6.34)
	Lining thickness	5.0 (0.20)	To the indicator

FRONT DRIVING MECHANISM			Unit: mm (in)
ITEM	STANDARDS		SERVICE LIMIT
Oil capacity	After draining	190 cm <sup>3</sup> (6.43 US oz, 6.67 Imp oz)	
	At disassembly	200 cm <sup>3</sup> (6.76 US oz, 7.02 Imp oz)	
Recommended oil	Hypoid gear oil SAE #80		
Clutch spring free height	2.65 (0.104)		2.5 (0.10)
Clutch disc thickness	A	2.7 - 2.8 (0.106 - 0.110)	2.4 (0.09)
	B	2.3 - 2.4 (0.091 - 0.094)	2.1 (0.08)
Pinion gear I.D.	12.000 - 12.018 (0.4724 - 0.4731)		12.05 (0.474)
Pinion gear shaft O.D.	11.973 - 11.984 (0.4714 - 0.4718)		11.75 (0.463)
Slip torque	17 - 25 N·m (1.7 - 2.5 kgf·ft, 12 - 18 lbf·ft)		
Gear backlash	0.05 - 0.30 (0.002 - 0.012)		0.40 (0.016)

Unit: mm (in)

**FRONT DRIVING MECHANISM ('98 - '01)**

ITEM		STANDARDS	SERVICE LIMIT
Oil capacity	After draining	190 cm <sup>3</sup> (6.4 US oz, 6.7 Imp oz)	
	At disassembly	200 cm <sup>3</sup> (6.8 US oz, 7.0 Imp oz)	
Recommended oil		Hypoid gear oil SAE #80	
Clutch spring free height		2.65 (0.104)	2.5 (0.10)
Clutch disc thickness	A	2.7 - 2.8 (0.106 - 0.110)	2.4 (0.09)
	B	2.3 - 2.4 (0.091 - 0.094)	2.1 (0.08)
Pinion gear I.D.		12.000 - 12.018 (0.4724 - 0.4731)	12.05 (0.474)
Pinion gear shaft O.D.		11.973 - 11.984 (0.4714 - 0.4718)	11.75 (0.463)
Slip torque		17 - 25 N·m (1.7 - 2.5 kgf·ft, 12 - 18 lbf·ft)	
Gear backlash		0.05 - 0.30 (0.002 - 0.012)	0.40 (0.016)

Unit: mm (in)

**FRONT DRIVING MECHANISM (After '01)**

ITEM		STANDARDS	SERVICE LIMIT
Front differential	Oil capacity		
	After draining	241 cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)	
	After disassembly	275 cm <sup>3</sup> (9.3 US oz, 9.7 Imp oz)	
Recommended oil		Hypoid gear oil SAE #80	
Gear backlash		0.05 - 0.25 (0.002 - 0.010)	0.4 (0.02)
Backlash difference			0.2 (0.01)
Slip torque		14 - 17 N·m (1.45 - 1.75 kgf·m,	12 N·m (1.2 kgf·m,
		10 - 13 lbf·ft)	9 lbf·ft)
Face cam-to-housing distance		6.3 - 6.7 (0.25 - 0.26)	6.3 (0.25)
Differential housing cap depth		9.55 - 9.65 (0.376 - 0.380)	9.55 (0.376)
Cone spring free height		2.8 (0.11)	2.6 (0.10)

Unit: mm (in)

**REAR DRIVING MECHANISM**

ITEM		STANDARDS	SERVICE LIMIT
Rear axle runout			3.0 (0.12)
Rear final drive	Oil capacity		
	After draining	90 cm <sup>3</sup> (3.0 US oz, 3.2 Imp oz)	
	At disassembly	100 cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)	
Recommended oil		Hypoid gear oil SAE #80	
Gear backlash		0.05 - 0.30 (0.002 - 0.012)	0.40 (0.016)

**BATTERY/CHARGING SYSTEM**

ITEM		SPECIFICATIONS
Battery	Capacity	12 V - 12 AH
	Current leakage	5 mA max.
	Voltage (20°C/68°F)	Fully charged
		13.0 - 13.2 V
	Charging current	Needs charging
		Below 12.3 V
	Normal	1.2 A/5 - 10 h
		5.0 A/1.0 h
Alternator	Capacity	0.310 kw 5,000 rpm
	Charging coil resistance (20°C/68°F)	0.1 - 1.0 Ω
Regulator/rectifier	Type	Triple phase full-wave rectification
	Regulated voltage	14.7 - 15.5 V at 5,000 rpm

## GENERAL INFORMATION

Unit: mm (in)

### IGNITION SYSTEM

ITEM		SPECIFICATIONS	
Spark plug	Standard	DPR7EA - 9 (NGK)	X22EPR - U9 (DENSO)
	For cold climate (below 5°C/41°F)	DPR6EA - 9 (NGK)	X20EPR - U9 (DENSO)
	For extended high speed riding	DPR8EA - 9 (NGK)	X24EPR - U9 (DENSO)
Spark plug gap		0.8 - 0.9 mm (0.03 - 0.04 in)	
Ignition coil peak voltage		100 V minimum	
Ignition pulse generator peak voltage		0.7 V minimum	
Ignition timing	"F" mark	10° BTDC at 1,400 rpm	
	Full advance	30° BTDC at 5,900 rpm	

Unit: mm (in)

### ELECTRIC STARTER

ITEM	STANDARDS	SERVICE LIMIT
Starter motor brush length	12.5 (0.49)	9.0 (0.35)

### LIGHTS/METERS/SWITCHES

ITEM			SPECIFICATIONS
Bulbs	Headlight	'98 - '01	12V - 25/25W X 2
		After '01	12V - 30/30W X 2
	Assist headlight		12V - 45W
	Taillight		12V - 5W X 2
	Brake Light (After '01 Quebec province only)		12V - 21CP
	Indicator (Oil/Reverse/Neutral)		LED
Fuse	Main fuse		30A
	Sub fuse	'98 - '01	15A X 2, 10A X 2
		After '01	15A X 2, 10A X 3
	MOTOR FUSE (TRX450 ES/FE only)		30 A

## TORQUE VALUES

FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)	FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)
5 mm hex bolt and nut	5 (0.5, 3.6)	5 mm screw	4 (0.4, 2.9)
6 mm hex bolt and nut	10 (1.0, 7)	6 mm screw	9 (0.9, 6.5)
8 mm hex bolt and nut	22 (2.2, 16)	6 mm flange bolt (8 mm head)	9 (0.9, 6.5)
10 mm hex bolt and nut	34 (3.5, 25)	6 mm flange bolt (10 mm head) and nut	12 (1.2, 9)
12 mm hex bolt and nut	54 (5.5, 40)	8 mm flange bolt and nut	26 (2.7, 20)
		10 mm flange bolt and nut	39 (4.0, 29)

- Torque specifications listed below are for important fasteners.
- Others should be tightened to standard torque values listed above.

- NOTES:
1. Apply sealant to the threads.
  2. Apply a locking agent to the threads.
  3. Stake.
  4. Apply oil to the threads and flange surface.
  5. Apply clean engine oil to the O-ring.
  6. Apply grease to the threads and flange surface.
  7. ALOC bolt: replace with a new one.
  8. Do not reuse; replace with a new one.
  9. Castle nut: Tighten to the specified torque then tighten to position suitable for cotter pin hole direction.

## ENGINE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
<b>Maintenance:</b>				
Oil drain bolt	1	12	25 (2.5, 18)	
Oil filter cover flange bolt	3	6	10 (1.0, 7)	
Spark plug	1	12	18 (1.8, 13)	
Timing hole cap	1	14	10 (1.0, 7)	
Valve adjuster lock nut	2	6	17 (1.7, 12)	
Clutch adjusting screw lock nut	1	8	22 (2.2, 16)	
<b>Lubrication System:</b>				
Oil pump rotor side plate screw	1	5	4 (0.40, 2.9)	
Relief valve cap	1	14	19 (1.9, 14)	NOTE 2
<b>Fuel System:</b>				
Carburetor cover screw	1	5	4 (0.4, 2.9)	
Starting enrichment (SE) valve nut	1	14	3 (0.3, 1.8)	
Insulator band screw (After '01)	1	5	4 (0.4, 2.9)	
<b>Cylinder Head/Valves/Camshaft:</b>				
Cylinder head flange cap nut	3	10	39 (4.0, 29)	NOTE 4
Camshaft bearing retainer bolt	1	8	26 (2.7, 20)	NOTE 2
Cam sprocket flange dowel bolt	2	7	20 (2.0, 14)	NOTE 2
Cam chain tensioner lifter sealing screw	1	6	4 (0.4, 2.9)	
Cam chain tensioner mounting bolt	2	6	12 (1.2, 9)	NOTE 2
Rocker arm holder flange cap nut	3	10	39 (4.0, 29)	NOTE 4
Rocker arm shaft flange bolt	1	6	7 (0.7, 5.1)	
<b>Clutch/Gearshift Linkage:</b>				
Gearshift return spring pin	1	8	22 (2.2, 16)	NOTE 2
Shift drum stopper arm bolt	1	6	12 (1.2, 9)	
Gearshift A arm bolt	1	8	25 (2.5, 18)	
Centrifugal clutch outer lock nut	1	20	118 (12.0, 87)	NOTE 3, 4
Clutch spring bolt	4	6	12 (1.2, 9)	
Change clutch center lock nut	1	18	108 (11.0, 80)	NOTE 3, 4
Drum shifter and guide plate bolt ('98 - '01)	1	6	12 (1.2, 9)	NOTE 2
(After '01)	1	6	16 (1.6, 12)	NOTE 2



## GENERAL INFORMATION

### ENGINE (Cont'd)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
<b>Recoil Starter:</b>				
Recoil pulley flange bolt	1	12	108 (11.0, 80)	NOTE 4
<b>Alternator/Starter Clutch:</b>				
Starter one-way clutch socket bolt	6	8	31 (3.1, 22)	NOTE 2
Stator socket bolt	3	6	10 (1.0, 7)	
<b>Ignition System:</b>				
Ignition pulse generator socket bolt	2	5	6 (0.6, 4.3)	NOTE 2
<b>Lights/Meters/Switches:</b>				
Neutral/reverse (or gear position) switch mounting bolt	1	6	12 (1.2, 9)	NOTE 2
Oil thermo sensor	1	12	18 (1.8, 13)	
Angle sensor (TRX450ES only)	2	6	6 (0.6, 4.3)	

### FRAME

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
<b>Frame/Body Panels/Exhaust System:</b>				
Muffler band bolt	2	8	23 (2.3, 17)	
Exhaust pipe protector bolt	3	6	22 (2.2, 16)	
Heat protector bolt	2	6	22 (2.2, 16)	
Heat guard bolt	4	6	20 (2.0, 14)	
Step bar mounting bolt	4	8	32 (3.3, 24)	
Cooling fan shroud special bolt	4	6	18 (1.8, 13)	
Fuel tank rear bracket bolt	4	6	18 (1.8, 13)	
Carrier mounting bolt ('98 - '01)	14	8	32 (3.3, 24)	
(After '01)	14	8	37 (3.8, 27)	
<b>Fuel System:</b>				
Fuel valve mounting bolt	2	6	9 (0.9, 6.5)	
Fuel level gauge mounting bolt	2	6	12 (1.2, 9)	
By-starter cap special bolt	1	14	2.3 (0.23, 1.6)	
<b>Clutch/Gearshift Linkage:</b>				
Gearshift pedal bolt ('98 - '01)	1	6	16 (1.6, 12)	
(After '01)	1	6	20 (2.0, 14)	
<b>Engine Mounting:</b>				
Lower engine mounting bolt (right)	1	10	54 (5.5, 40)	
Lower engine mounting bolt (left)	1	10	54 (5.5, 40)	
Upper engine hanger bolt	1	10	54 (5.5, 40)	
Upper engine hanger bracket bolt	2	8	32 (3.3, 24)	
Lower engine hanger bracket bolt	2	8	32 (3.3, 24)	
<b>Front Wheel/Suspension/Steering:</b>				
Throttle case cover	3	4	4 (0.4, 2.5)	
Handlebar lower holder nut	2	10	39 (4.0, 29)	NOTE 8
Steering shaft U-nut	1	14	108 (11.0, 80)	NOTE 6
Tie-rod ball joint self lock nut	4	12	54 (5.5, 40)	
Tie-rod lock nut	4	12	54 (5.5, 40)	
Steering shaft holder flange bolt	2	8	32 (3.3, 24)	
Upper/lower arm pivot self lock nut	8	10	44 (4.5, 33)	NOTE 8
Knuckle ball joint castle nut ('98 - '01)	4	12	29 (3.0, 22)	NOTE 9
(After '01)	4	12	32 (3.3, 24)	NOTE 9
Shock absorber upper mounting self lock nut	2	10	44 (4.5, 33)	NOTE 8
Shock absorber lower mounting self lock nut	2	10	44 (4.5, 33)	NOTE 9
Damper rod lock nut	2	10	37 (3.8, 27)	NOTE 2
Front wheel nut	8	10	64 (6.5, 47)	
Front wheel hub castle nut	2	16	78 (8.0, 58)	NOTE 9

## FRAME (Cont'd)

ITEM	QTY	THREAD DIA. (mm)	TORQUE N-m (kgf-m, lbf-ft)	REMARKS
<b>Rear Wheel/Suspension:</b>				
Rear axle castle nut	2	20	137 (14.0, 101)	NOTE 9
Rear wheel nut	8	10	64 (6.5, 47)	
Shock absorber lower mounting self lock nut	1	10	44 (4.5, 33)	NOTE 8
Shock absorber upper mounting self lock nut	2	10	39 (4.0, 29)	NOTE 8
Shock absorber lower mounting bolt	1	10	44 (4.5, 33)	
Damper rod lock nut	2	10	37 (3.8, 27)	NOTE 2
Swingarm left pivot bolt	1	30	113 (11.5, 83)	
Swingarm right pivot bolt ('98 - '01)	1	30	4 (0.40, 2.9)	
(After '01)	1	30	10 (1.0, 7)	
Swingarm right pivot lock nut	1	30	113 (11.5, 83)	
Rear axle housing and swingarm nut	8	10	44 (4.5, 33)	NOTE 8
Skid plate flange bolt	3	8	32 (3.3, 24)	
<b>Brakes:</b>				
Rear brake arm pinch bolt/nut	1	8	20 (2.0, 14)	
Rear brake panel drain bolt ('98 - '01)	1	12	34 (3.5, 25)	
(After '01)	1	12	12 (1.2, 9)	
Master cylinder reservoir cap screw	2	4	2 (0.20, 1.4)	
Master cylinder holder SH bolt	2	6	12 (1.2, 9)	
Brake lever pivot bolt	1	6	1 (0.10, 0.7)	
Brake lever pivot lock nut	1	6	6 (0.6, 4.3)	
Brake hose oil bolt	4	10	34 (3.5, 25)	
Brake hose clamp flange bolt	2	6	12 (1.2, 9)	
Brake panel flange bolt	8	8	29 (3.0, 22)	NOTE 8
Wheel cylinder bolt/washer	4	6	8 (0.8, 5.8)	
Wheel cylinder nut	4	8	17 (1.7, 12)	
Wheel cylinder oil pipe	4	10	16 (1.6, 12)	
Brake bleeder valve	2	8	6 (0.6, 4.3)	
Breather hose clamp (knuckle)	2	8	32 (3.3, 24)	
Brake hose 2-way joint	2	8	15 (1.5, 11)	
<b>Front Driving Mechanism:</b>				
Differential case mounting bolt/nut, 10 mm	2	10	44 (4.5, 33)	
8 mm	1	8	22 (2.2, 16)	
Differential case cover flange bolt, 8 mm	6	8	25 (2.6, 19)	
10 mm	2	10	49 (5.0, 36)	NOTE 2
Pinion joint nut ('98 - '01)	1	16	108 (11.0, 80)	NOTE 2
Pinion bearing lock nut ('98 - '01)	1	64	98 (10.0, 72)	NOTE 3
Differential gear case drain bolt	1	8	12 (1.2, 9)	
Differential gear case cover oil cap	1	30	12 (1.2, 9)	
Differential case cap torx bolt ('98 - '01)	6	8	32 (3.3, 24)	NOTE 7
Differential case UBS bolt ('98 - '01)	6	8	49 (5.0, 36)	
Differential ring gear bolt (After '01)	6	8	49 (5.0, 36)	NOTE 8
Speed sensor mounting bolt (After '01)	2	6	10 (1.0, 7)	
Final clutch speed sensor mounting bolt (After '01)	2	6	10 (1.0, 7)	
Final clutch mounting bolt (After '01)	3	8	25 (2.6, 19)	
Final clutch cover bolt (After '01)	2	6	7 (0.7, 5)	
<b>Rear Driving Mechanism:</b>				
Gear case cover flange bolt, 8 mm	6	8	25 (2.6, 19)	
10 mm	2	10	49 (5.0, 36)	NOTE 2
Pinion joint nut ('98 - '01)	1	16	108 (11.0, 80)	NOTE 2
Pinion bearing lock nut	1	64	98 (10.0, 72)	NOTE 3
Gear case drain bolt	1	8	12 (1.2, 9)	
Gear case cover oil check bolt	1	8	12 (1.2, 9)	
Gear case cover oil cap	1	30	12 (1.2, 9)	

## GENERAL INFORMATION

### TOOLS

- NOTES: 1. Newly designed tool.  
 2. Equivalent commercially available in U.S.A.  
 3. Not available in U.S.A.  
 4. Alternative tool.

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SEC.
Carburetor float level gauge	07401 - 0010000		5
Flywheel holder	07725 - 0040000	NOTE 2	10
Rotor puller	07733 - 0020001	NOTE 4: 07933 - 3950000 (U.S.A. only)	10
Remover weight	07741 - 0010201	NOTE 4: 07936 - 371020A or 07936 - 3710200	8, 13 15 (After '01)
Valve guide driver, 5.5 mm	07742 - 0010100		7
Attachment, 37 X 40 mm	07746 - 0010200		11, 12, 13
Attachment, 42 X 47 mm	07746 - 0010300		8, 11
Attachment, 52 X 55 mm	07746 - 0010400		10, 11, 12, 14 15, 16
Attachment, 62 X 68 mm	07746 - 0010500		14, 16
Attachment, 72 X 75 mm	07746 - 0010600		11
Attachment, 24 X 26 mm	07746 - 0010700		10, 11
Attachment, 22 X 24 mm (After '01)	07746 - 0010800		15
Driver, 22 mm I.D.	07746 - 0020100		8
Attachment, 15 mm I.D.	07746 - 0020200		8
Driver, 40 mm I.D.	07746 - 0030100		15, 16
Attachment, 25 mm I.D. ('98 - '01)	07746 - 0030200		15, 16
Attachment, 30 mm I.D. (After '01)	07746 - 0030300		15, 16
Pilot, 10 mm	07746 - 0040100		10
Pilot, 15 mm (After '01)	07746 - 0040300		15
Pilot, 17 mm	07746 - 0040400		8, 11, 13, 14
Pilot, 20 mm	07746 - 0040500		11, 12
Pilot, 25 mm	07746 - 0040600		11
Pilot, 30 mm	07746 - 0040700		12
Pilot, 35 mm	07746 - 0040800		11
Pilot, 40 mm	07746 - 0040900		11
Pilot, 22 mm	07746 - 0041000		11
Pilot, 28 mm	07746 - 0041100		14, 15
Pilot, 14 mm (After '01)	07746 - 0041200		15
Driver	07749 - 0010000		8, 10, 11, 12, 13, 14, 15, 16
Valve spring compressor	07757 - 0010000		7
Valve seat cutter		NOTE 2	
Seat cutter, 29 mm (45' EX)	07780 - 0010300		7
Seat cutter, 35 mm (45' IN)	07780 - 0010400		7
Flat cutter, 30 mm (32' EX)	07780 - 0012200		7
Flat cutter, 35 mm (32' IN)	07780 - 0012300		7
Interior cutter, 30 mm (60' EX)	07780 - 0014000		7
Interior cutter, 37.5 mm (60' IN)	07780 - 0014100		7
Cutter holder, 5.5 mm	07781 - 0010101		7
Swingarm lock nut wrench	07908 - 4690003		13
Snap ring pliers	07914 - 3230001		14
Lock nut wrench, 30 X 64 mm ('98 - '01)	07916 - MB00002	NOTE 4: 07916 - MB00001	15, 16

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SEC.
Bearing remover set	07936 - 3710001	NOTE 3	11
- Remover handle	07936 - 3710100		11
- Bearing remover, 20 mm	07936 - 3710600		11
- Remover weight	07741 - 0010201	NOTE 4: 07936 - 371020A or 07936 - 3710200	11
Remover handle	07936 - 3710100		8, 11, 13
Bearing remover, 17 mm	07936 - 3710300		8, 11, 13
Clutch puller	07933 - HA80000	NOTE 4: 07933 - HB3000A	8
Attachment	07945 - 3330300	NOTE 4: 07746 - 0010400	12
Attachment, 28 X 30 mm	07946 - 1870100		12
Driver handle attachment	07949 - 3710001		12
Oil seal driver (After '01)	07965 - KE80100		15
Driver attachment	07965 - KE80200	NOTE 4: 07947 - KA50100	15 ('98 - '01), 16
Oil seal driver	07965 - MC70100		14
Assembly collar	07965 - VM00100		11
Assembly shaft	07965 - VM00200	NOTE 4: 07931 - ME4010B and 07931 - HB3020A (U.S.A. only)	11
Threaded adapter	07965 - VM00300	NOTE 4: 07931 - KF00200 (U.S.A. only)	11
Valve guide reamer, 5.5 mm	07984 - 2000001	NOTE 4: 07984 - 200000D (U.S.A. only)	7
Clutch holder	07GMB - HA70101	NOTE 4: 07GMB-HA7010A or 07GMB-HA7011A and 07GMB-HA7012A	8
Inspection adaptor	07GMJ - ML80100		20
Peak voltage adapter	07HGJ - 0020100	NOTE 4: Peak voltage tester (U.S.A. only)	18
Pinion puller set	07HMC - MM80101	NOTE 3	15 ('98 - '01), 16
- Shaft puller	07931 - ME40000	NOTE 4: 07931 - ME4010B and 07931 - HB3020A (U.S.A. only)	15 ('98 - '01), 16
- Pinion puller base	07HMC - MM80110	NOTE 4: 07HMC - MM8011A (U.S.A. only)	15, 16
Adjustable bearing puller (After '01)	07JAC - PH80101		15
Remover shaft (After '01)	07JAC - PH80200		15
Oil seal driver attachment	07JAD - PH80101		10, 12
Clutch center holder	07JMB - MN50300	NOTE 4: 07HGB - 001010B and 07HGB - 001020B (U.S.A. only)	8
Differential inspection tool	07KMK - HC50101	NOTE 4: 07KMK - HC5010A (U.S.A. only)	15
Ball joint remover, 28 mm	07MAC - SL00200		12, 14
Pilot, 32 mm	07MAD - PR90200		11, 16
Ball joint installer base	07HAF - SF10120		12
Recoil pulley holder	07SMB - HM70100		10
Pinion holder ('98 - '01)	07SMB - HM70200		15, 16
Ball joint remover/installer	07WMF - HN00100	NOTE 1	12
Universal bead breaker	GN-AH-958-BB1		12, 13

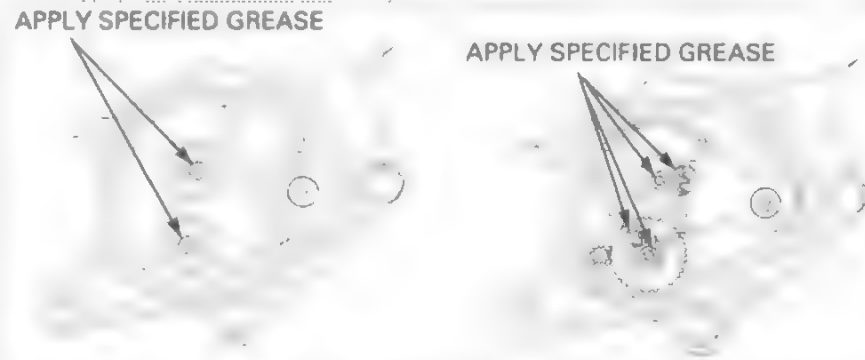


## GENERAL INFORMATION

### LUBRICATION & SEAL POINTS

ENGINE	LOCATION	MATERIAL	REMARKS
	Oil filter cover inside Cylinder bore Cylinder stud bolt threads (at cap nut) Piston pin bore and piston outer surface Piston ring surface Connecting rod small end inner surface Centrifugal clutch outer lock nut threads Cam follower surface Cam chain surface Rocker arm both ends Clutch friction disc surface Clutch lifter plate outer surface Centrifugal clutch outer sliding surface Clutch drive plate one-way clutch sliding surface Transmission bearing and gear teeth surface Transmission bushing journal surface Main shaft and countershaft journal surface Change clutch center lock nut threads Shift fork shaft surface Shift drum grooves and surface Reverse stopper shaft journal surface Starter idle gear teeth Recoil pulley bolt threads Starter one-way clutch surface Each ball and needle bearing rolling area Each oil seal lip Crankshaft oil path	Engine oil	
	Piston pin outer surface Camshaft lobes Rocker arm shaft (rocker arm sliding surface) Valve stem sliding surface Clutch outer guide sliding surface Starter reduction shaft A surface Starter reduction shaft surface Starter motor pinion end	Molybdenum disulfide oil (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	
	Cam sprocket bolt threads Cam chain tensioner 6 mm flange bolt threads Camshaft bearing fixing plate 8 mm bolt threads Relief valve 14 mm cap threads Gearshift return spring pin threads Starter one-way clutch socket bolt threads Neutral/reverse switch 6 mm bolt threads Ignition pulse generator 5 mm socket bolt threads	Locking agent	
	Change switch grommet Alternator wire grommet Alternator cover gasket	Sealant	

**ENGINE (cont'd)**

LOCATION	MATERIAL	REMARKS
Front cover shift reduction gears (TRX450ES only)	Unirex N2 (ESSO) Unirex N3 (ESSO) or equivalent	Apply 3 - 5g of recommended grease.
		

**FRAME**

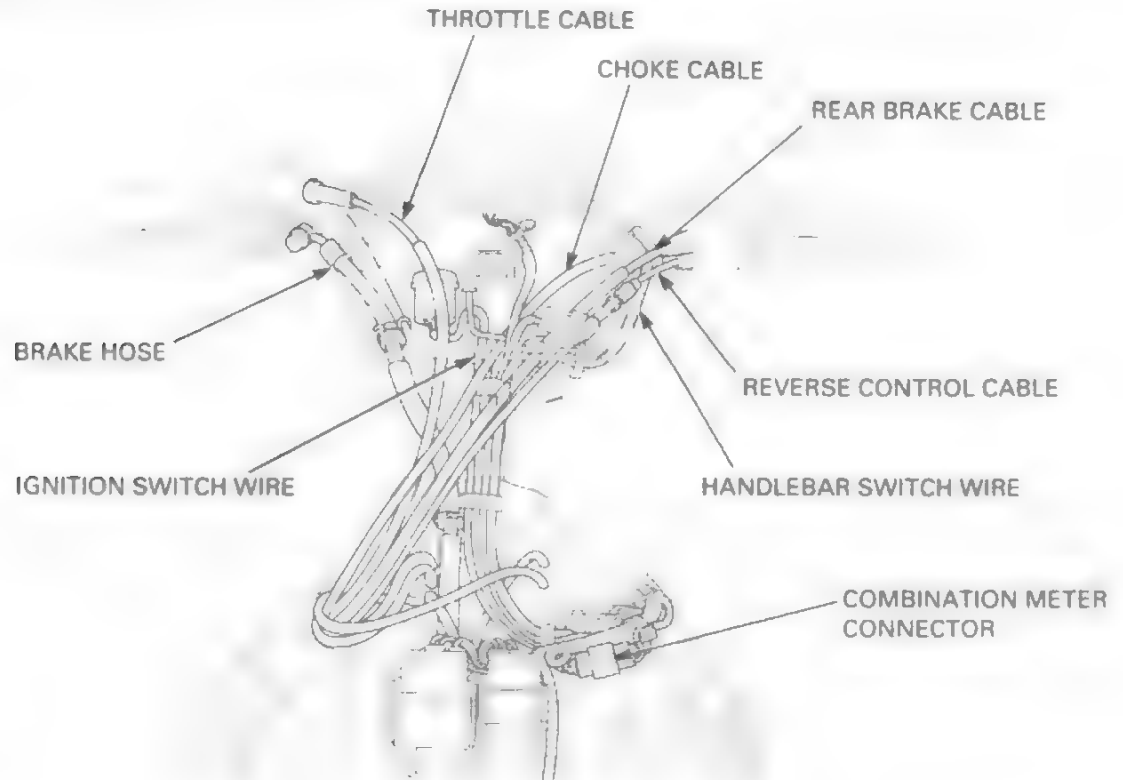
LOCATION	MATERIAL	REMARKS
Steering bushing sliding surface	Multi-purpose grease	Apply 2 - 3 g of grease
Steering shaft oil seal lip		
Steering shaft dust seal lip		
Steering shaft nut threads		Apply 0.5 - 1.0 g of grease
Steering shaft spline		
Knuckle dust seal lip and side seal		
Rear brake cable end		Apply 0.5 - 1.0 g of grease
Rear brake cam shaft sliding surface		
Rear brake cam dust seal lip		
Rear brake panel dust seal lip		Apply 0.5 - 1.0 g of grease
Rear brake shoe cam contact surface		
Rear brake shoe anchor pin contact surface		
Brake pedal shaft sliding surface		Apply 0.5 - 1.0 g of grease
Brake pedal dust seal lip		
Brake cover seal lip and side seal		
Brake lever pivot sliding surface		Fill up 3 g minimum
Brake lever parking arm pin sliding surface		
Rear brake panel O-ring		
Left axle housing seal lip		
Left axle housing bearing		
Front final drive pinion joint oil seal lip		
Front drive shaft oil seal lip		
Front differential oil cap O-ring		
Front differential pinion joint O-ring		
Front final clutch dust seal lip (After '01)		
Front final clutch oil seal lip (After '01)		
Front final clutch needle bearing (After '01)		
Front drive pinion spline (After '01)		
Rear final drive pinion joint oil seal lip		
Rear final drive ring gear oil seal lip		
Rear final drive oil cap O-ring		
Rear final drive pinion joint O-ring		
Cross joing needle bearing		
Swingarm bearing and grease holder		
Swingarm bearing dust seal lip		
Throttle cable end		

## GENERAL INFORMATION

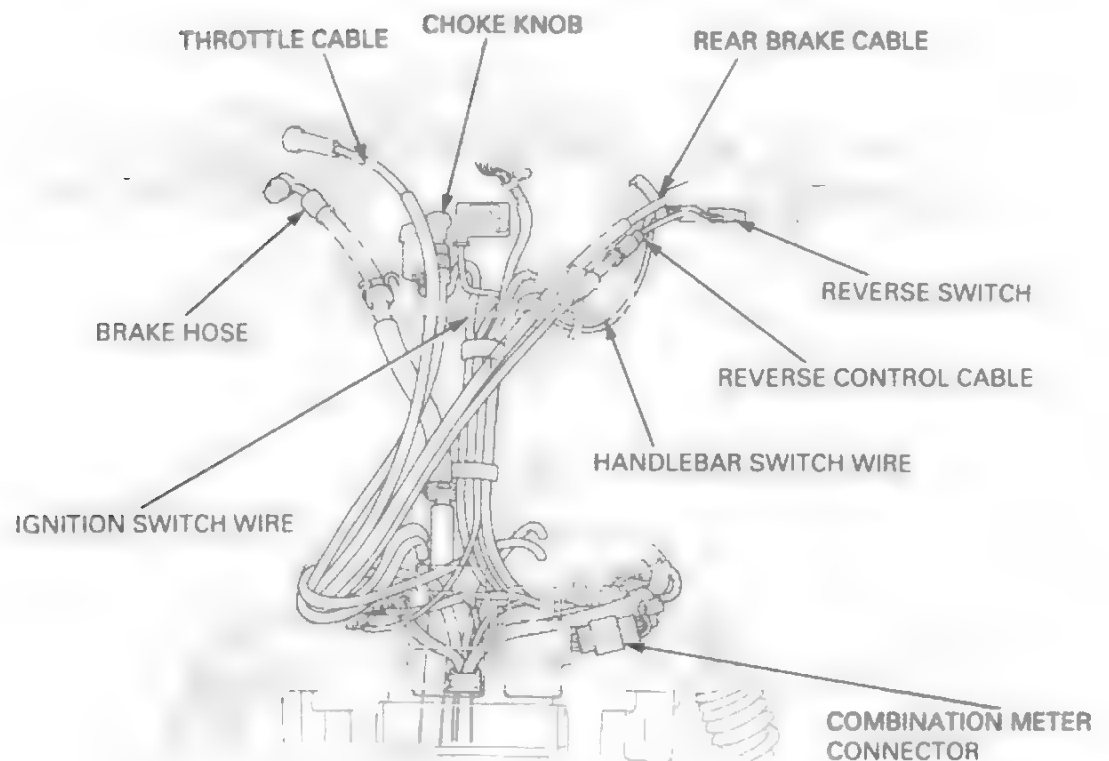
FRAME (Cont'd)		
LOCATION	MATERIAL	REMARKS
Front brake drum water seal lip and outside lip inside	Multi-purpose grease NLGI NO.3	Fill up 14 – 16 g of grease
Rear axle shaft spline (left side) (center) (right side)	Molybdenum disulfide grease	Apply grease to 20 mm width of area of 10 mm away from spline right end so that spline is filled with grease.
Rear wheel hub dust seal lip		Fill up 5 – 8 g of grease
Front differential pinion joint spline		Fill up 5 – 8 g of grease
Rear final drive pinion joint spline		
Yoke joints spline		Fill up 5 – 8 g of grease
Front propeller shaft joint spline (Differential side) (Engine side)		Fill up 5 – 8 g of grease
Rear propeller shaft seal lip		
Front propeller shaft seal lip		
Front drive shaft spline (Wheel side)		
Front drive shaft boot inside (Inboard) (Outboard)		40 – 60 g 30 – 50 g
Rear brake inner cable	Cable lubricant	
Throttle inner cable		
Reverse assist inner cable		
Choke inner cable		
Front differential case	Hypoid gear oil SAE #90	200 cc (6.76 oz)
Rear final drive case		100 cc (3.38 oz)
Front differential case mating surface	Liquid sealant (Three-bond 1215 or equivalent)	
Rear final drive case mating surface		
Handlebar grip rubber inside	Handa bond A or Cemedine #540	

# CABLE & HARNESS ROUTING

TRX450S ('98-'01):

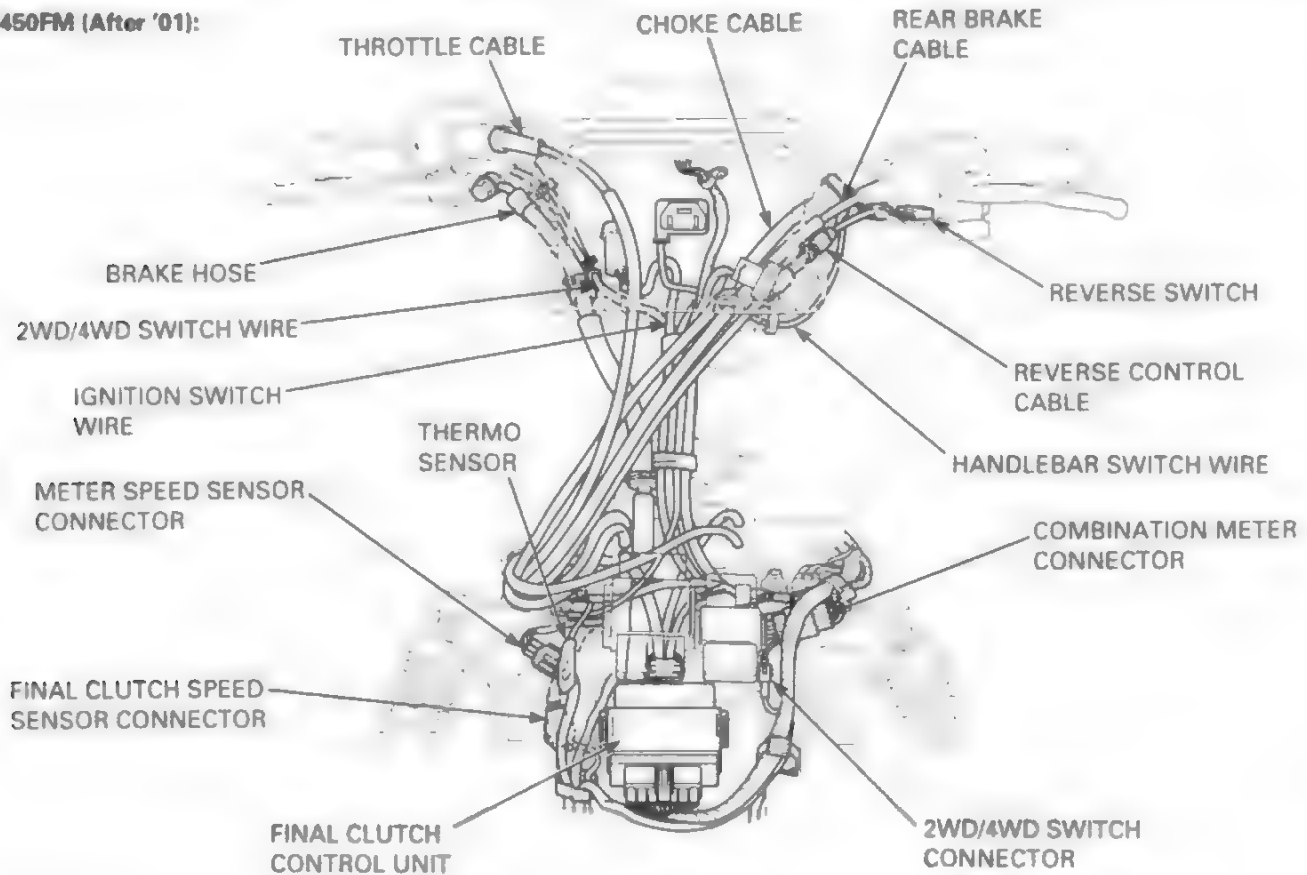


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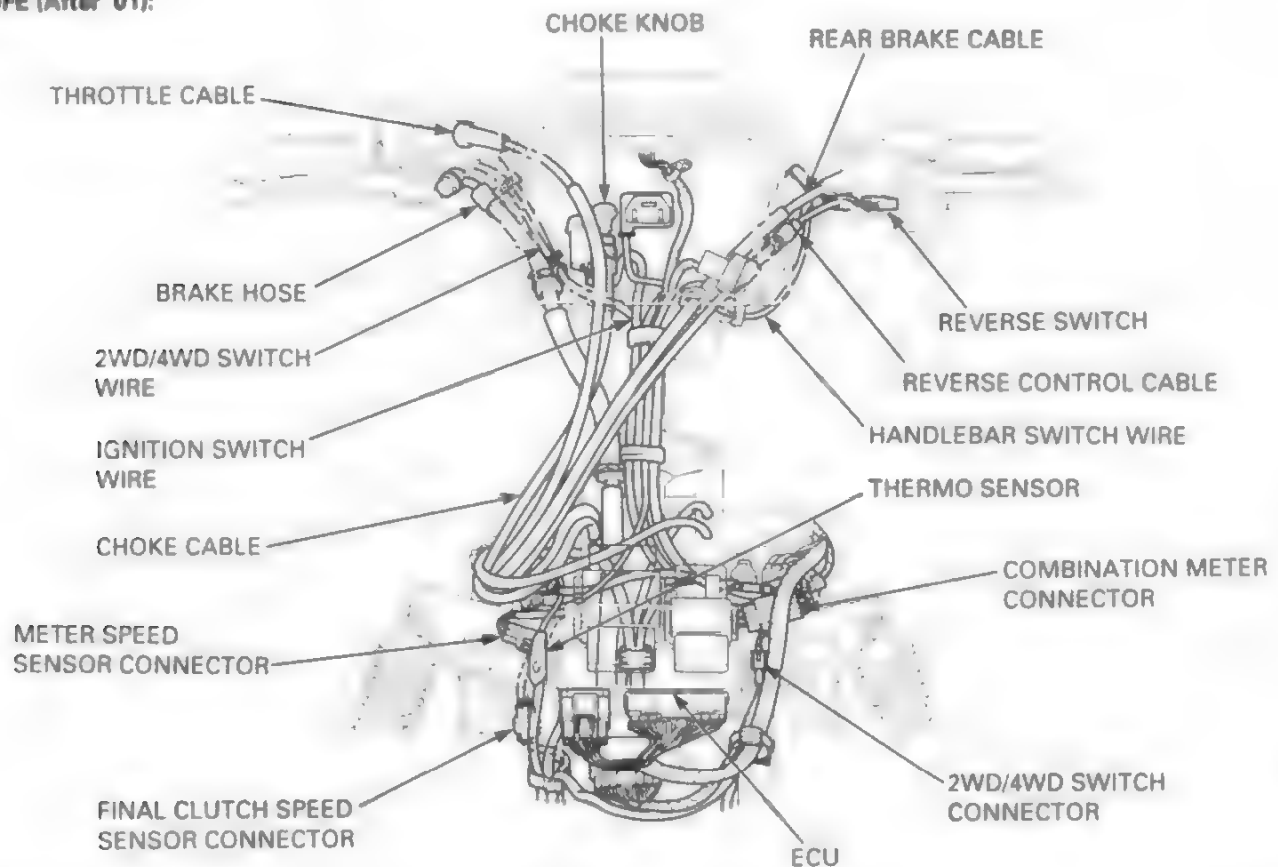


## GENERAL INFORMATION

### TRX450FM (After '01):

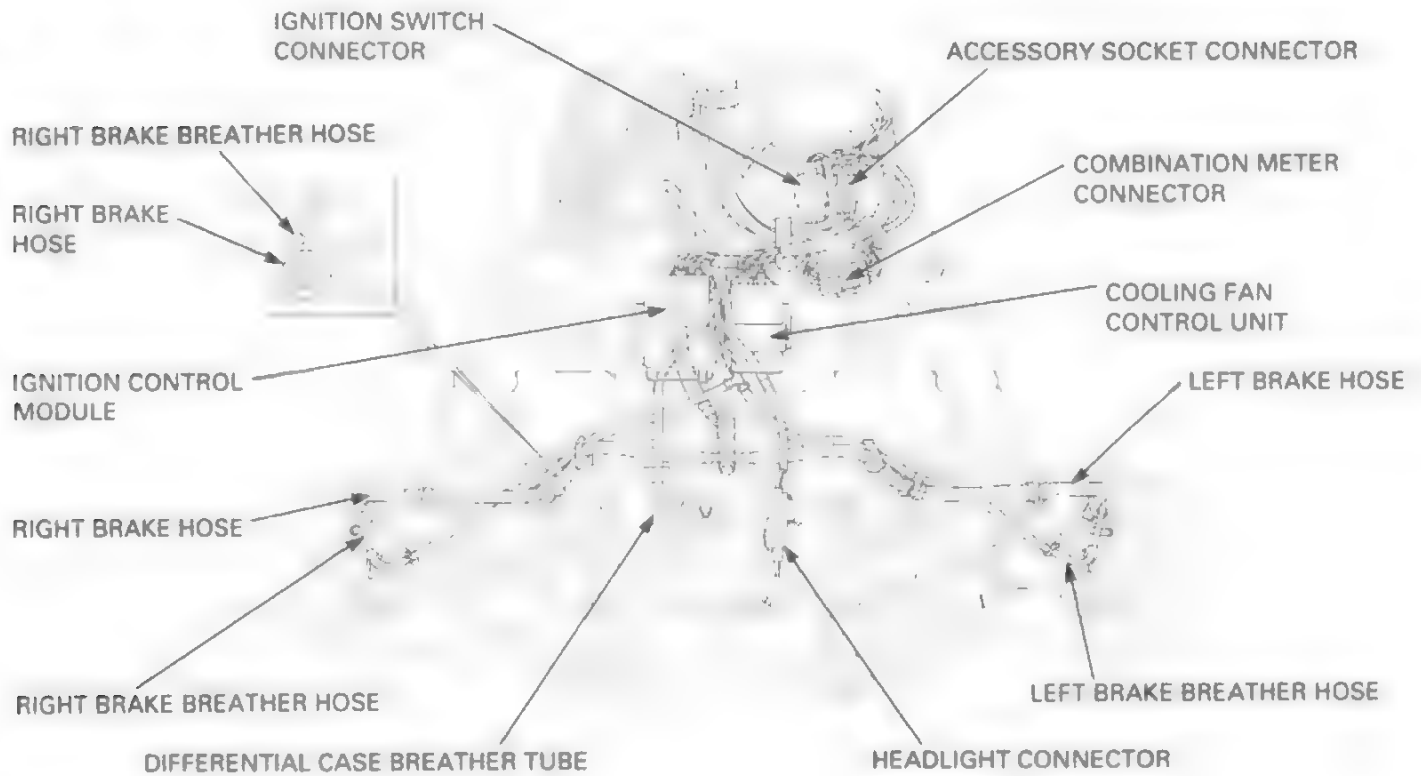


### TRX450FE (After '01):

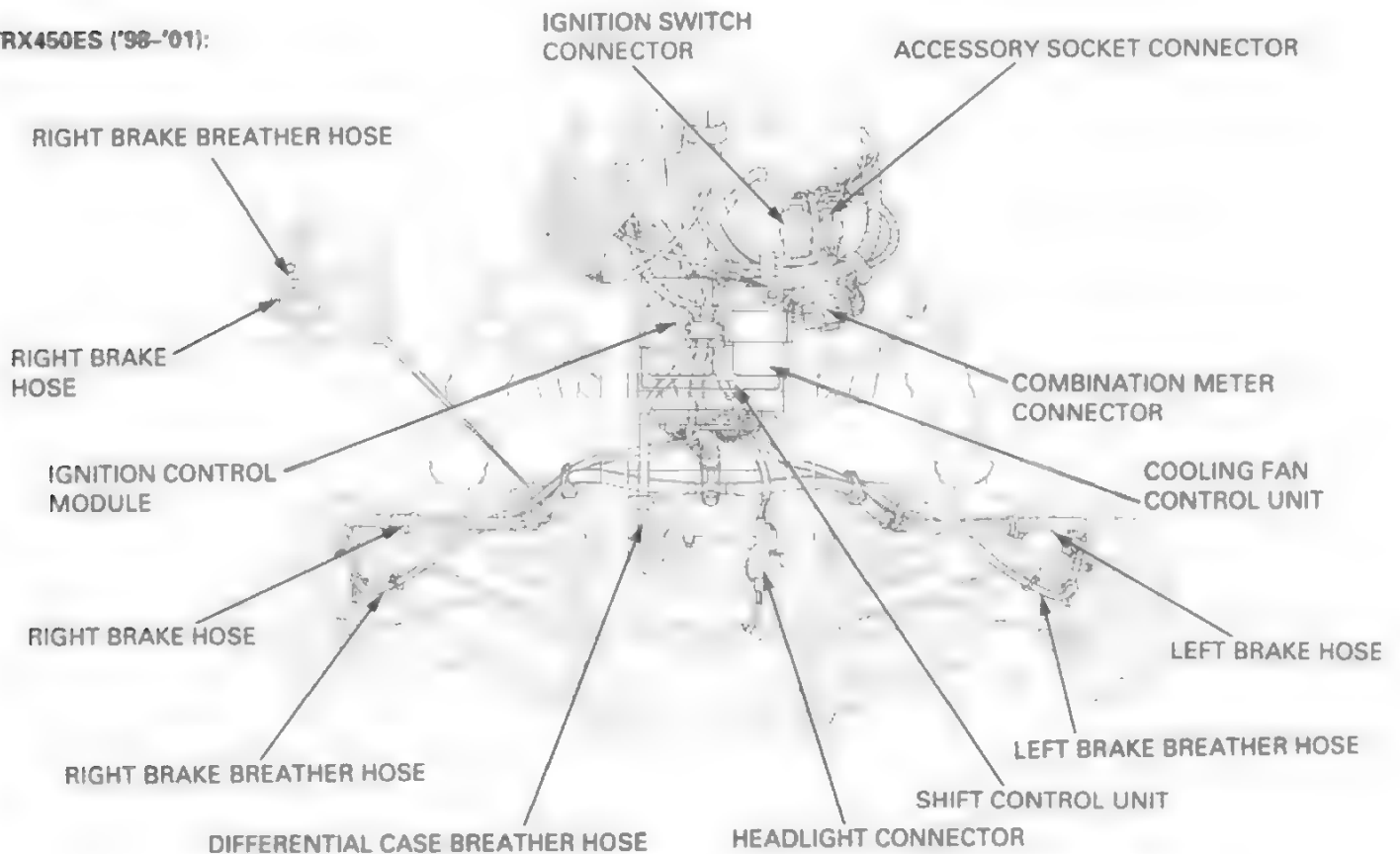




## TRX450S ('98-'01):

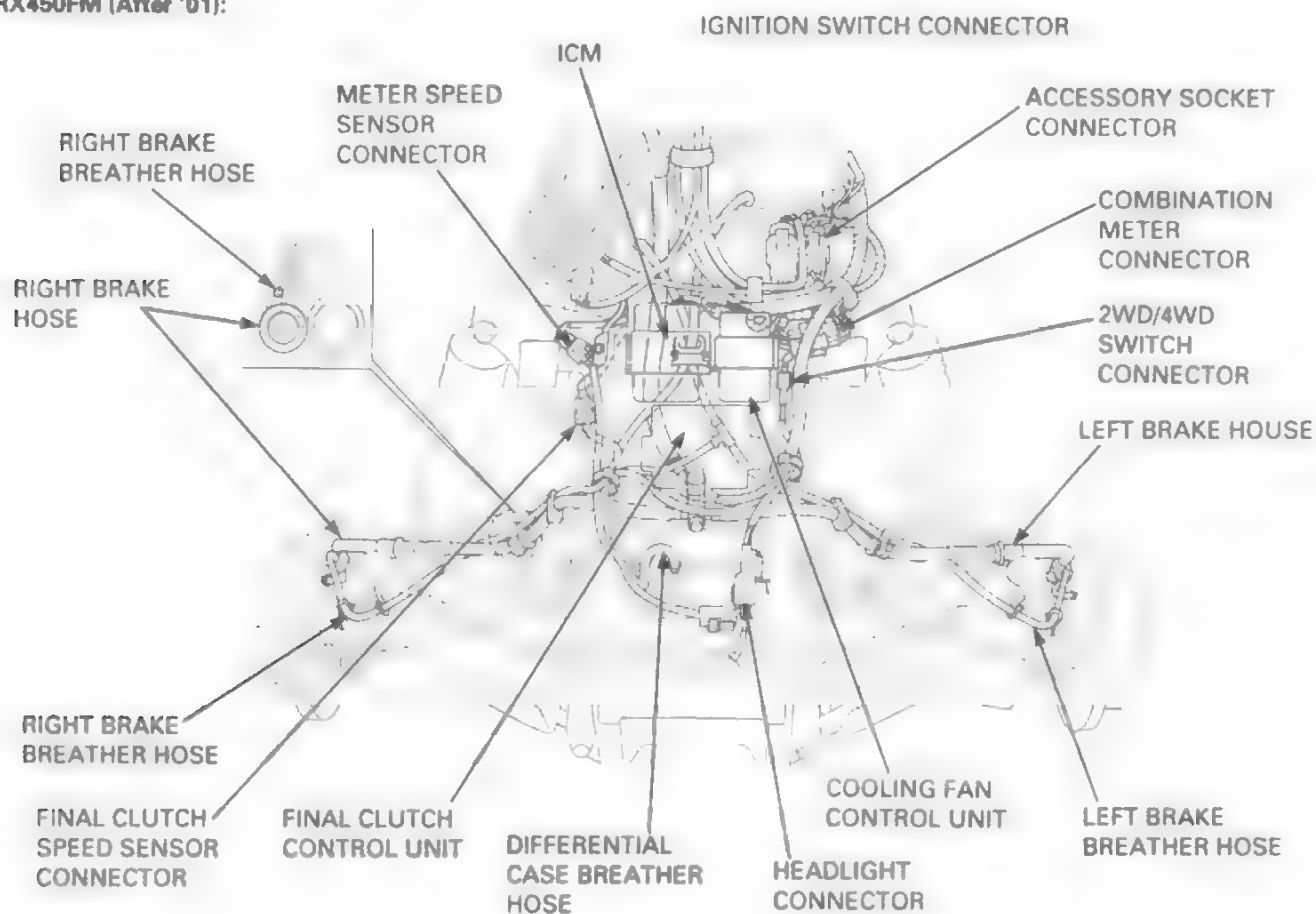


## TRX450ES ('98-'01):

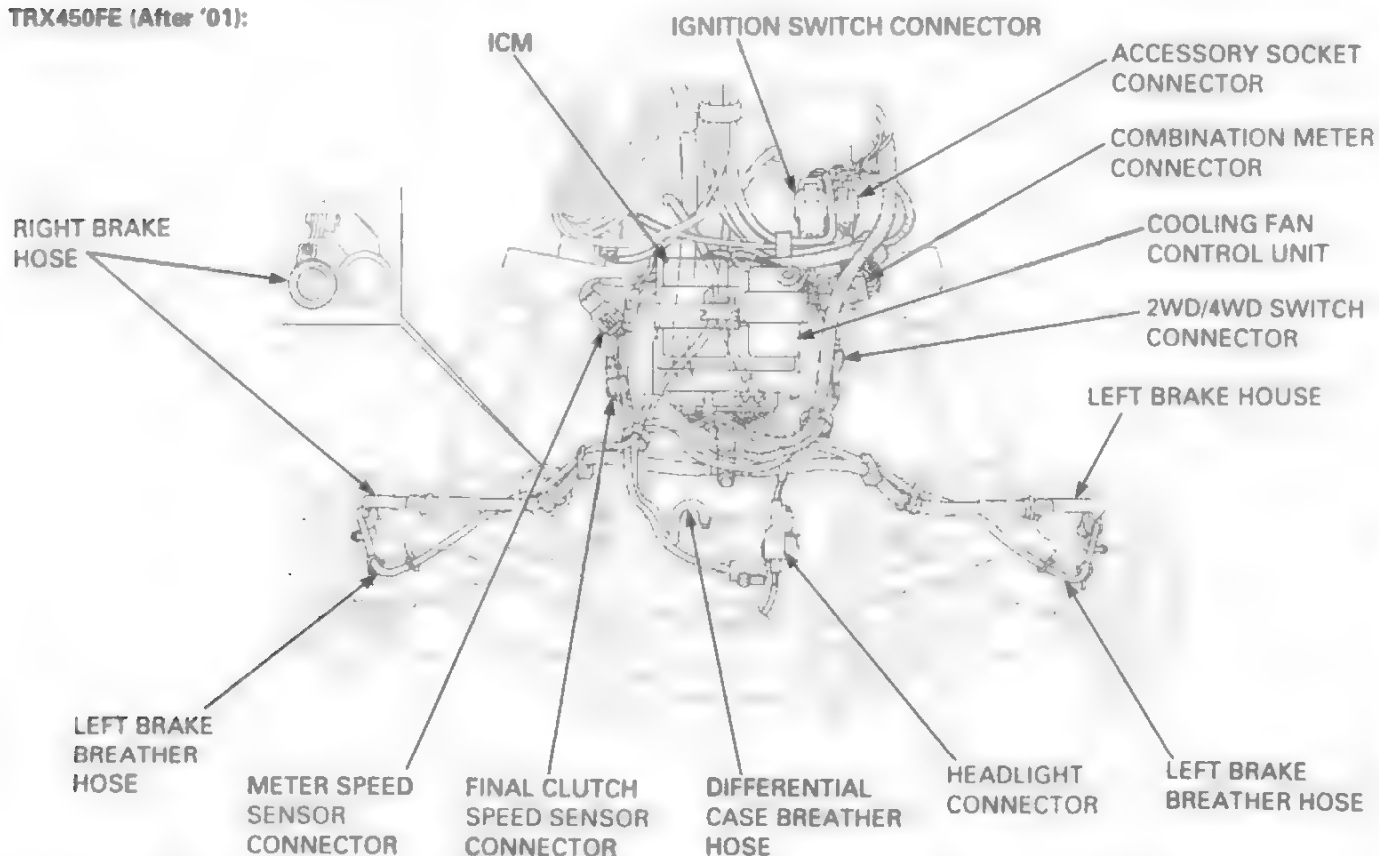


## GENERAL INFORMATION

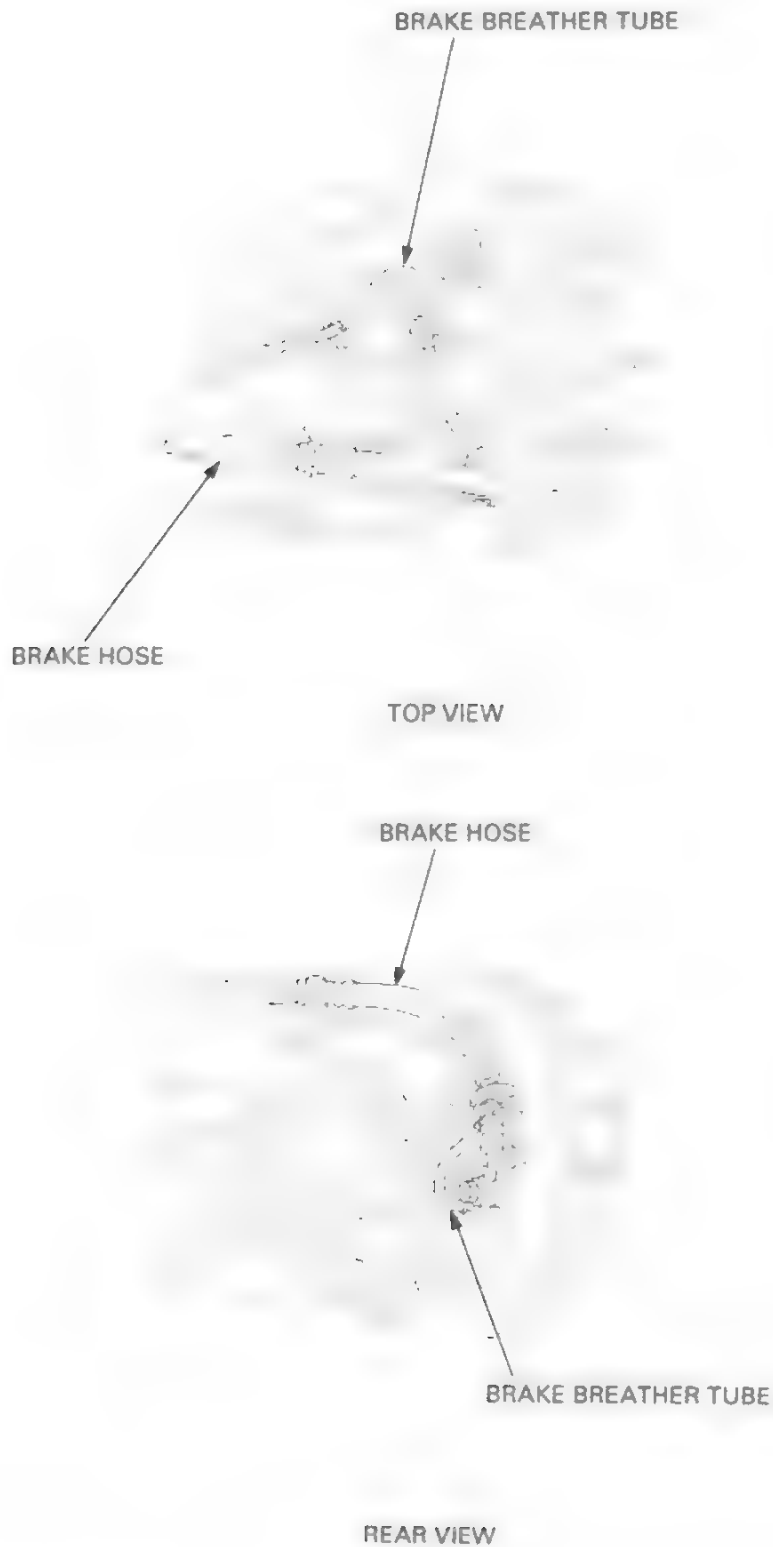
TRX450FM (After '01):



TRX450FE (After '01):

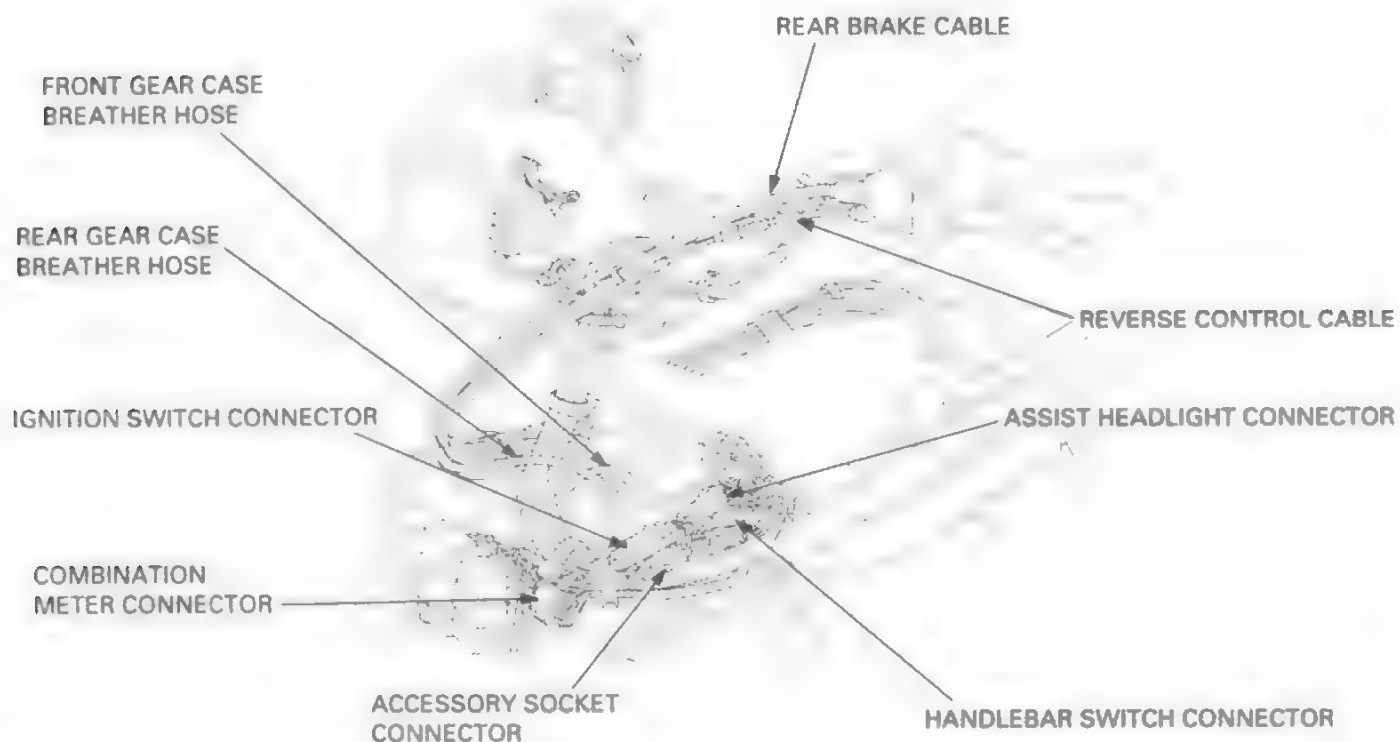


TRX450S AND TRX450ES:

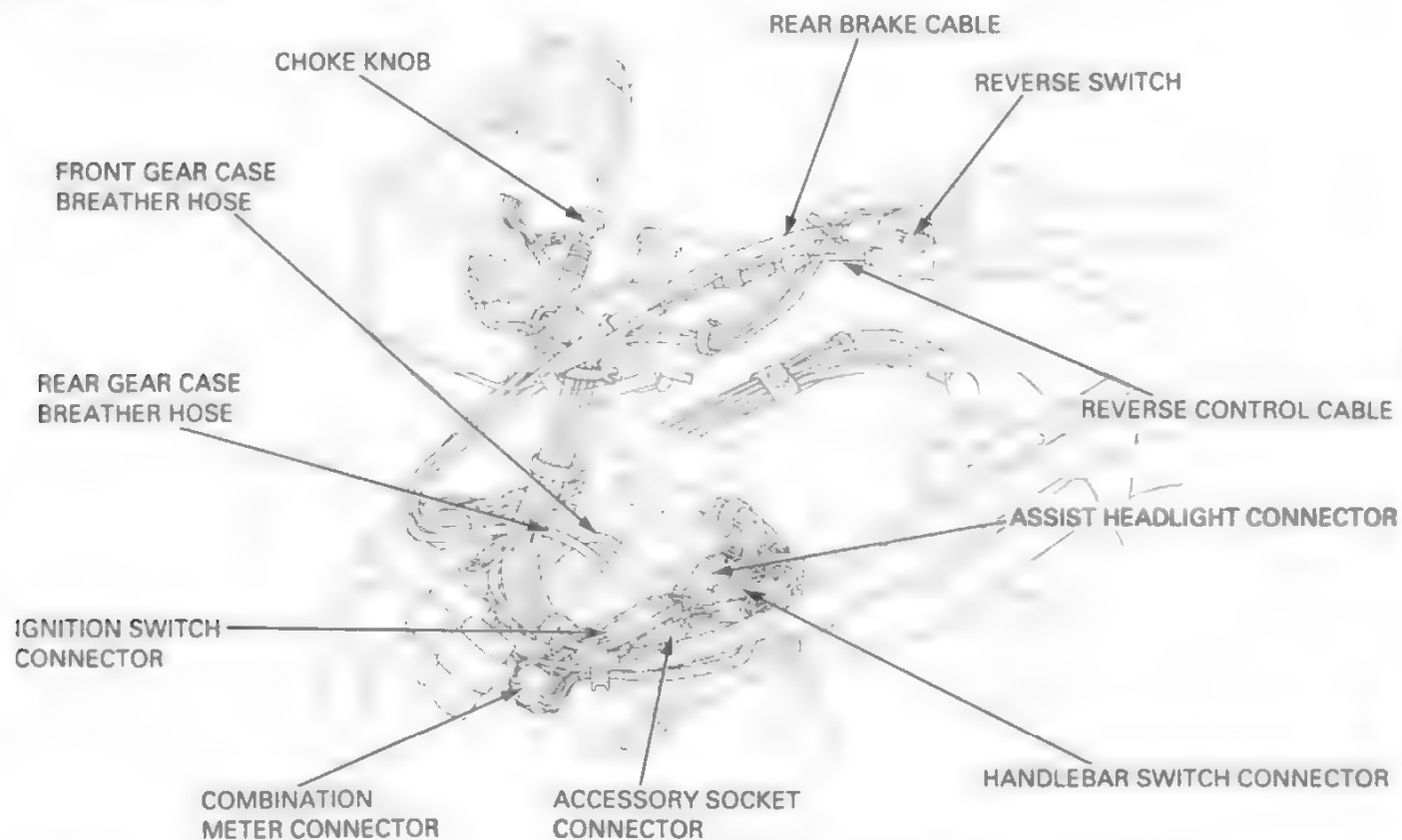


## GENERAL INFORMATION

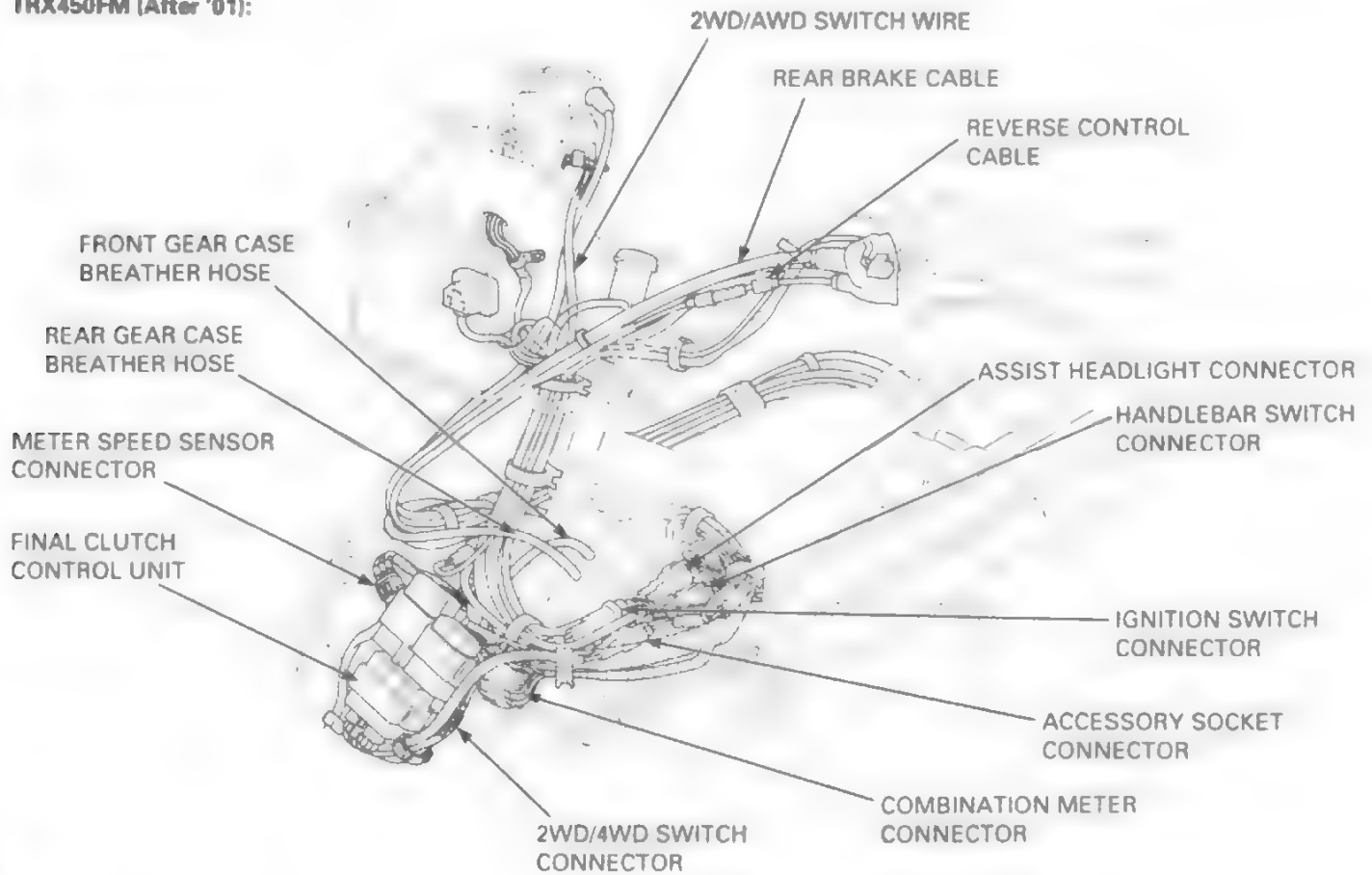
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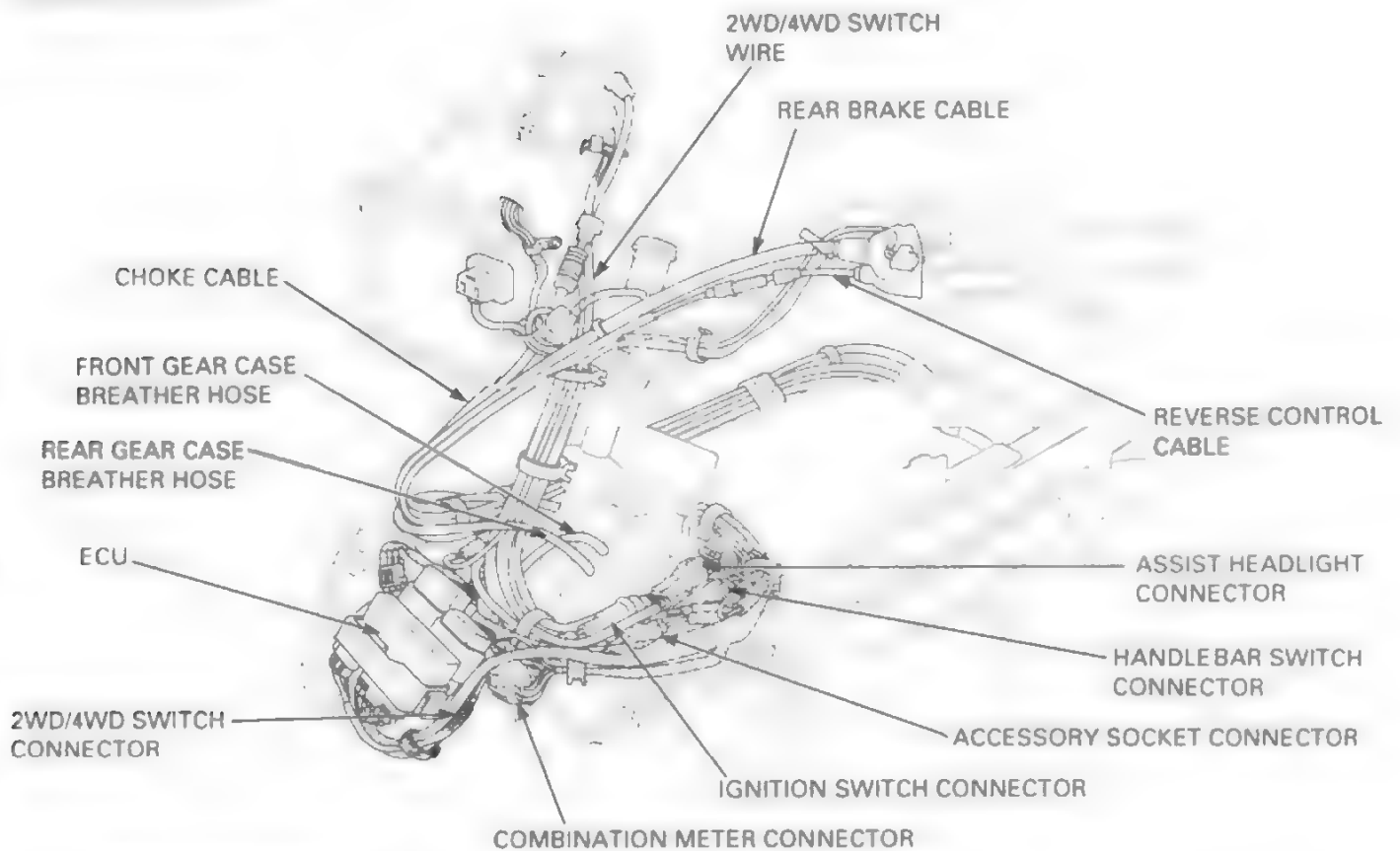
### TRX450ES ('98-'01):



## TRX450FM (After '01):



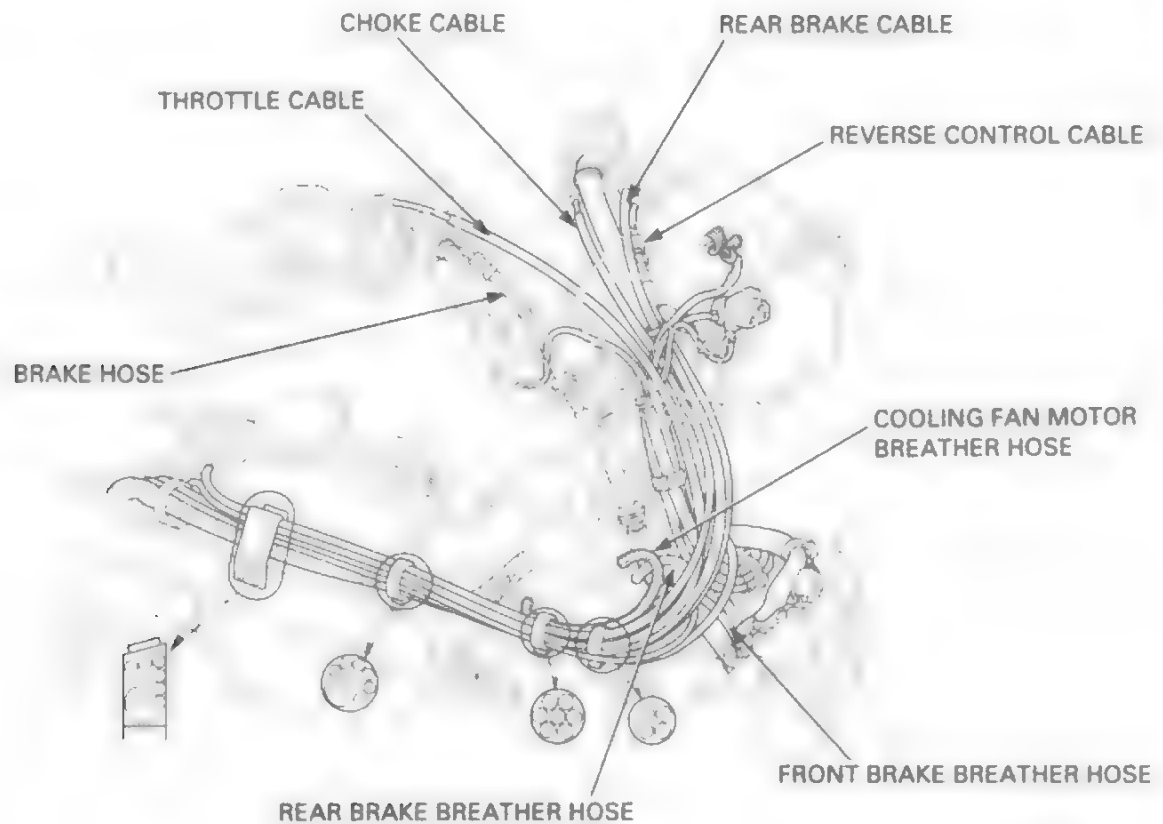
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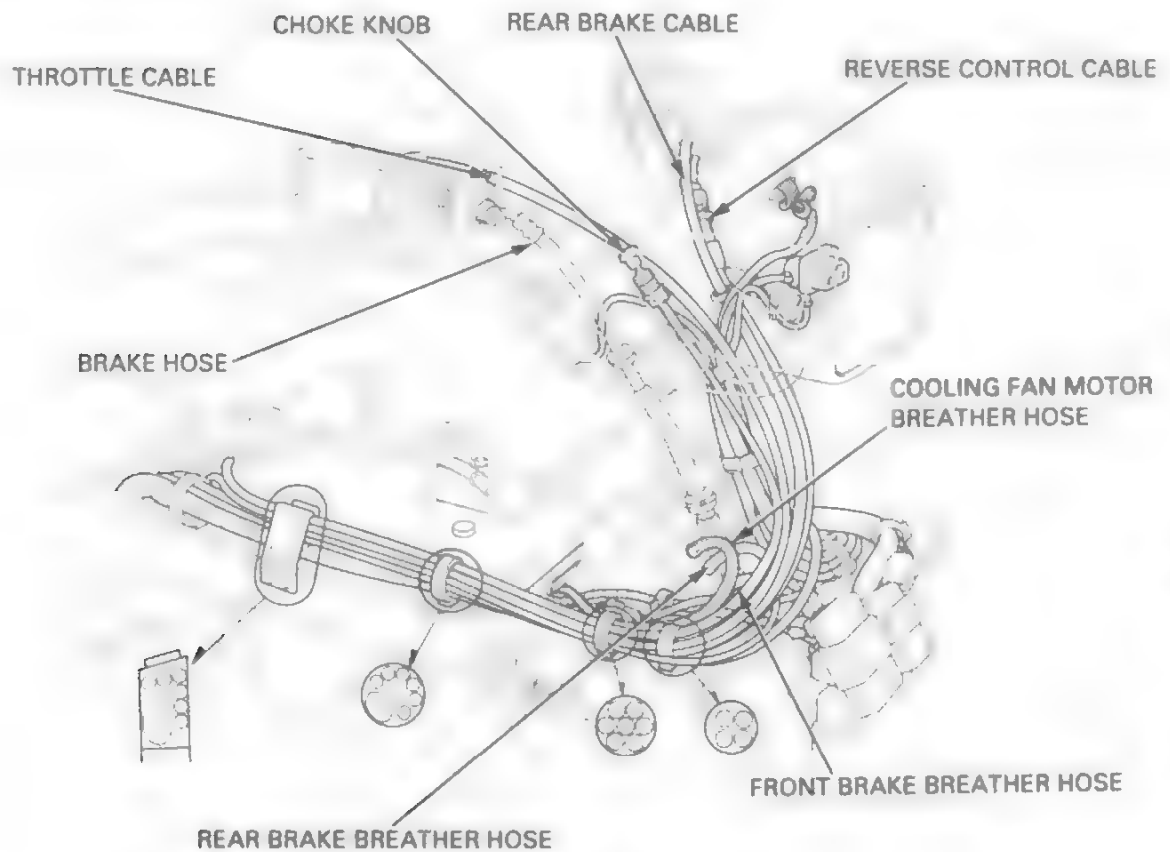


## GENERAL INFORMATION

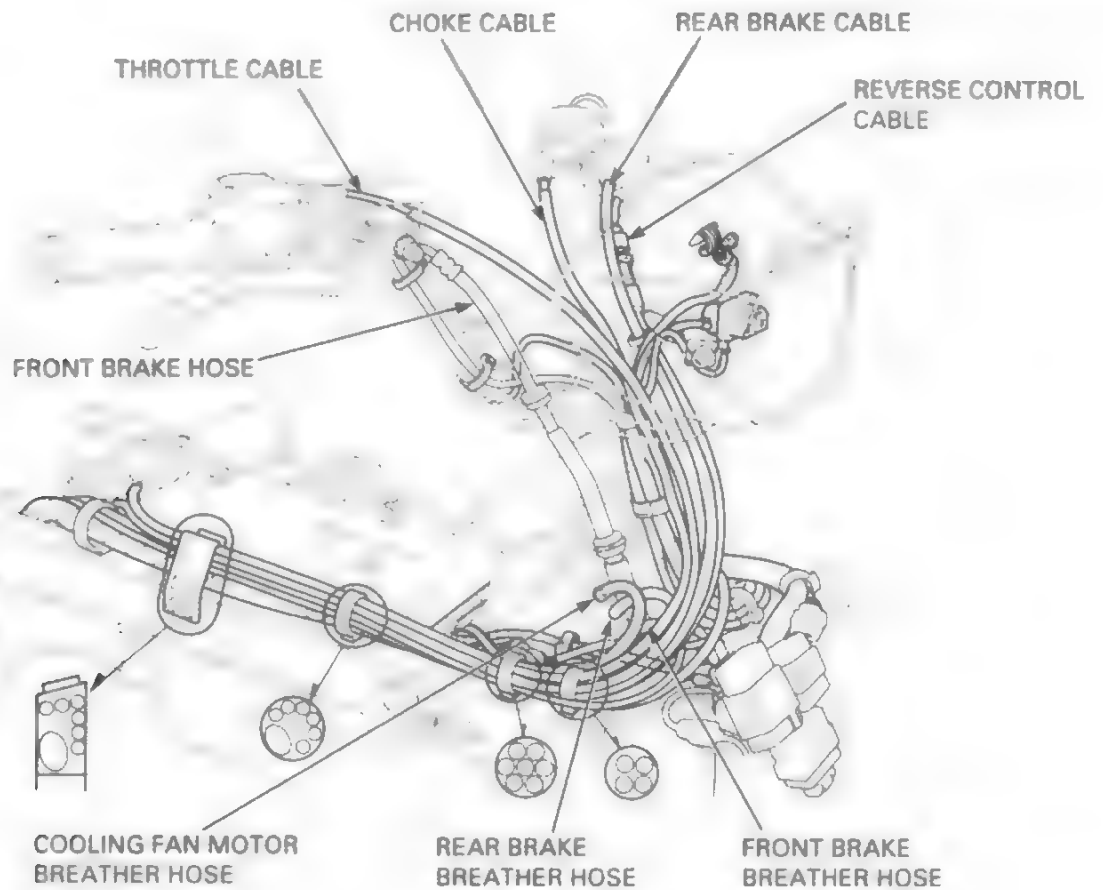
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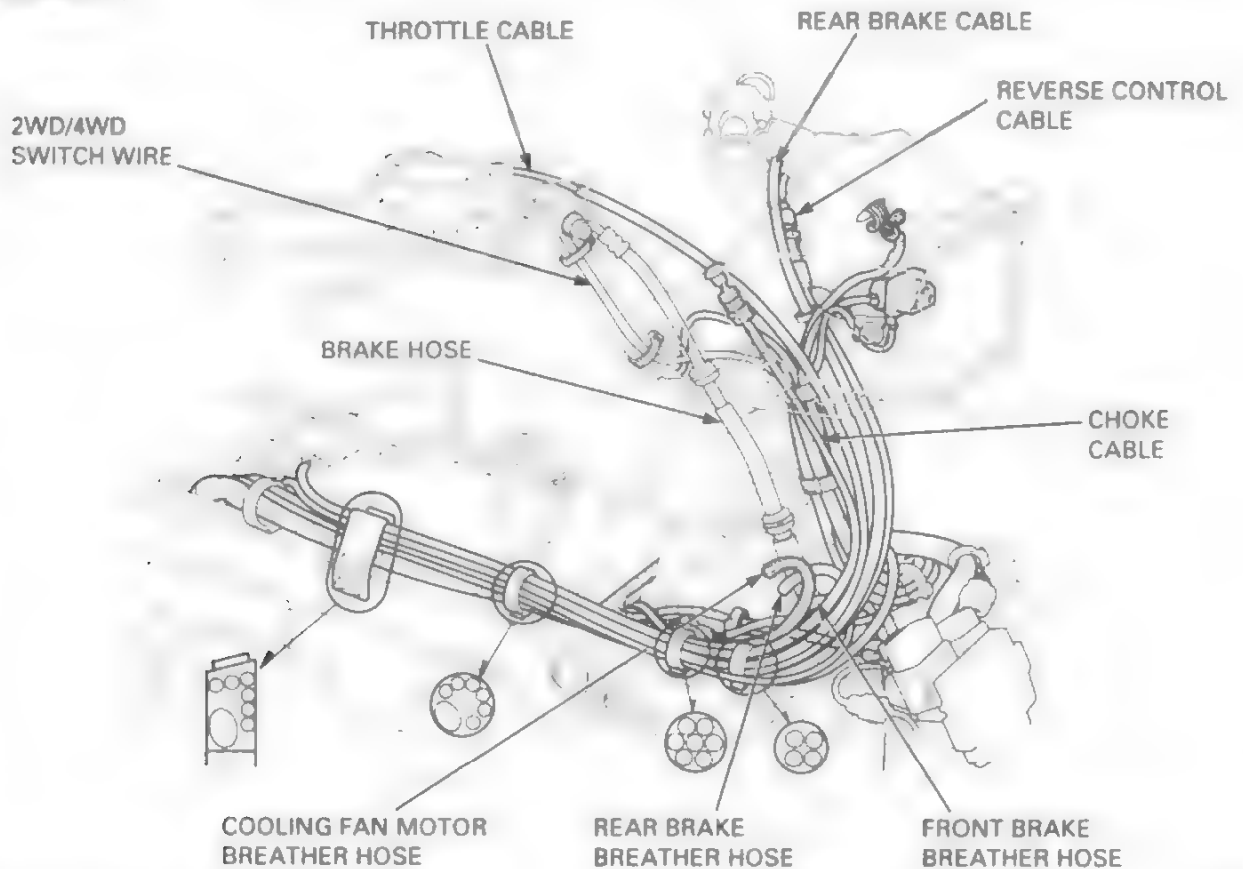
TRX450ES ('98-'01):



TRX450FM (After '01):

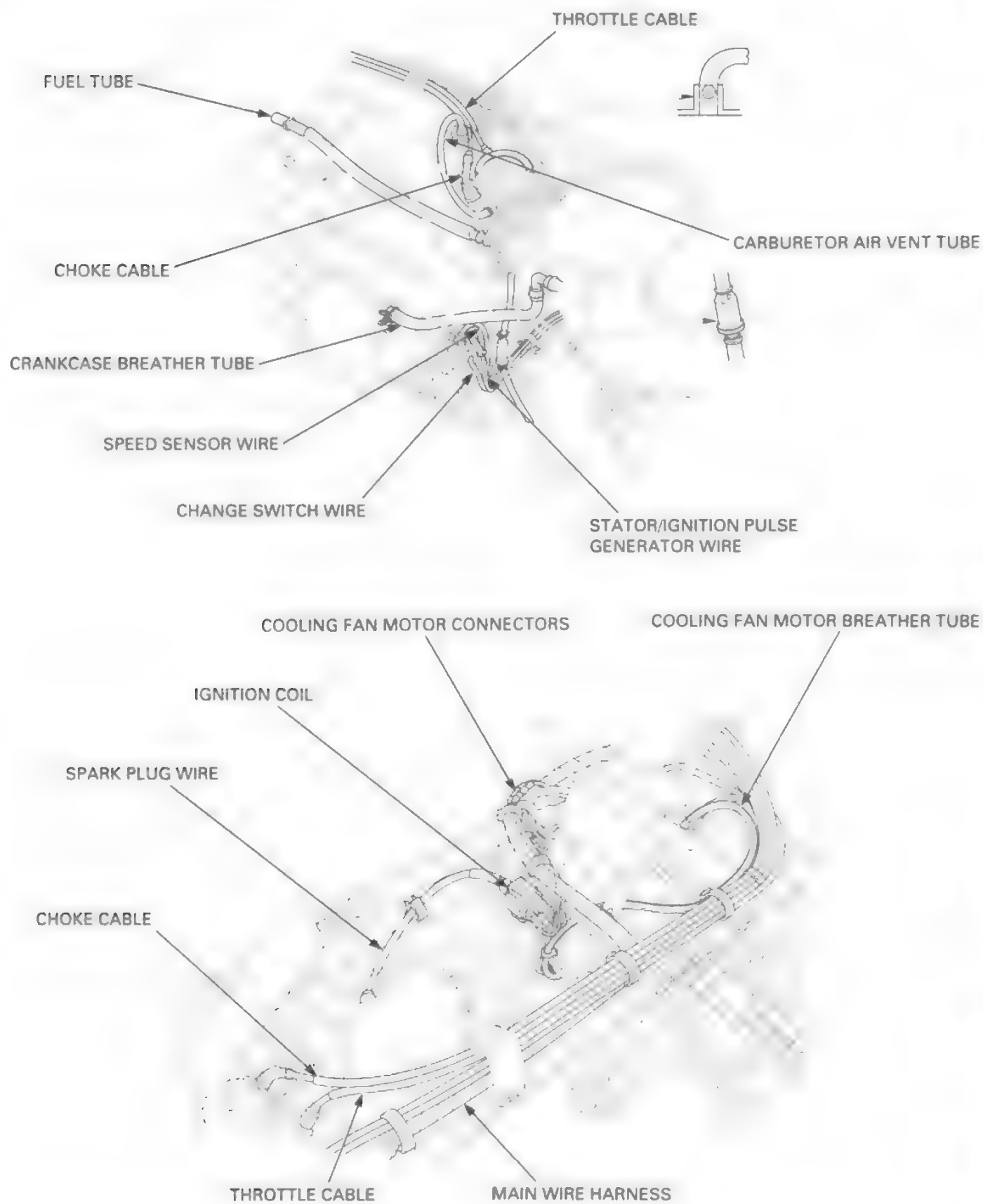


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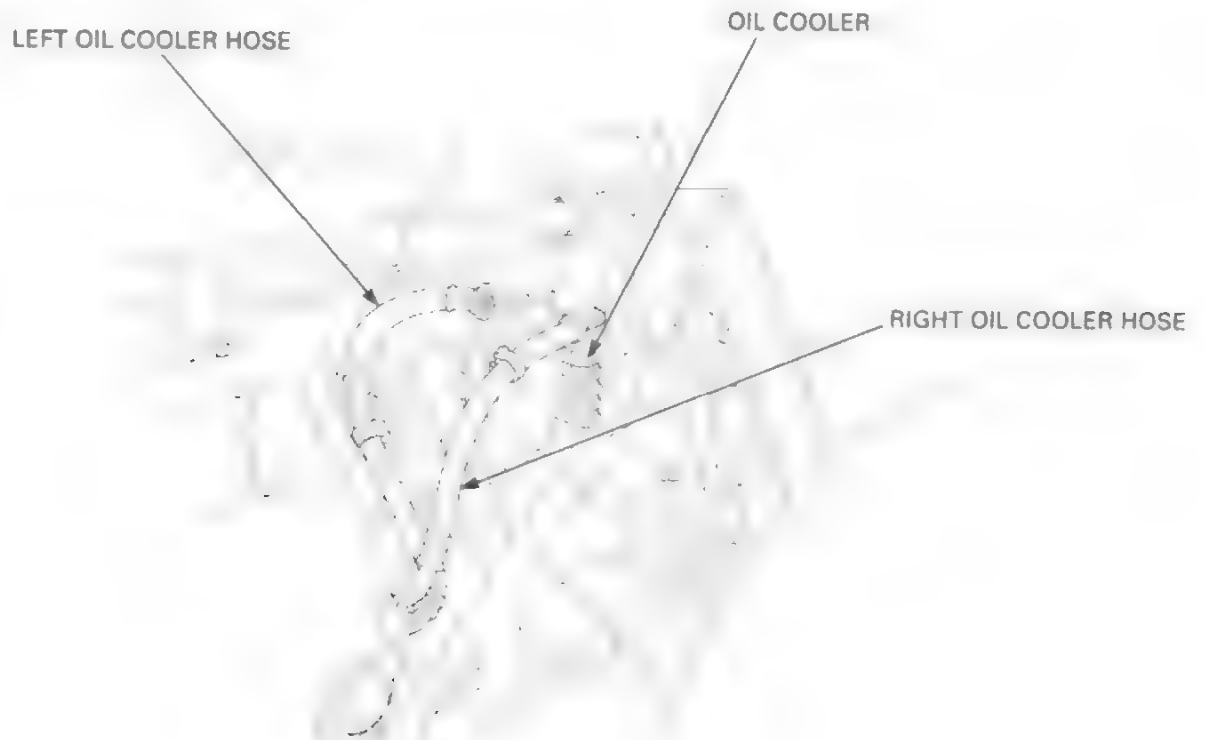


## GENERAL INFORMATION

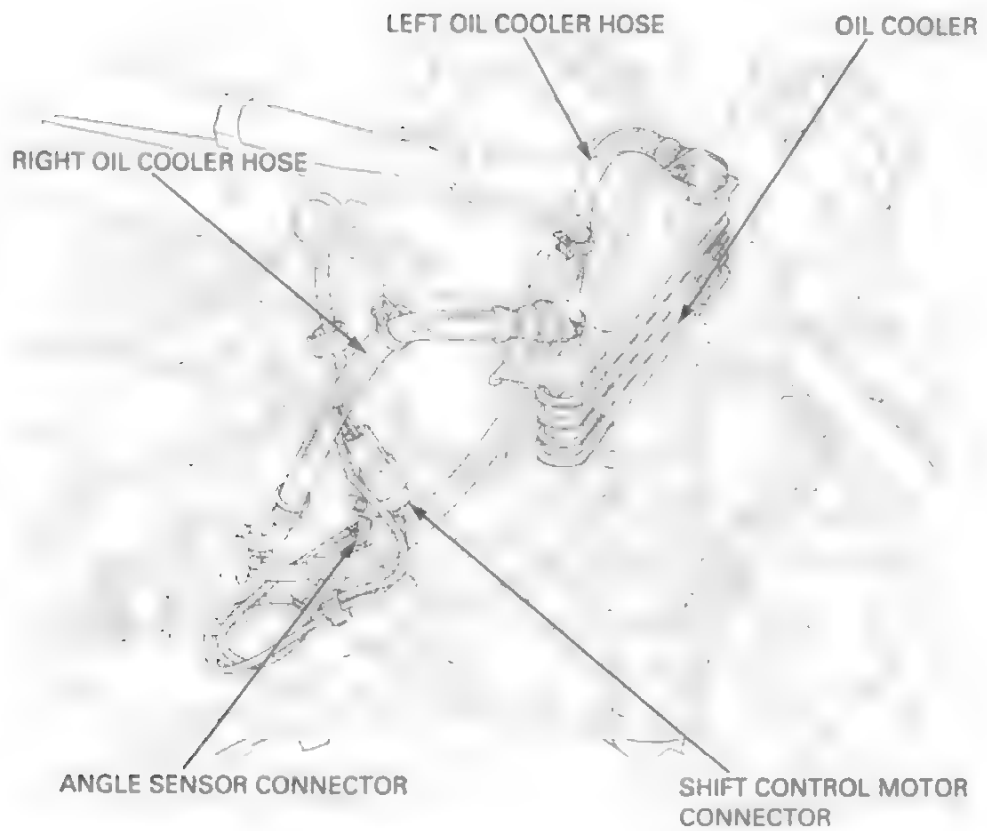
TRX450S/FM AND TRX450ES/FE:



TRX450S/FM:

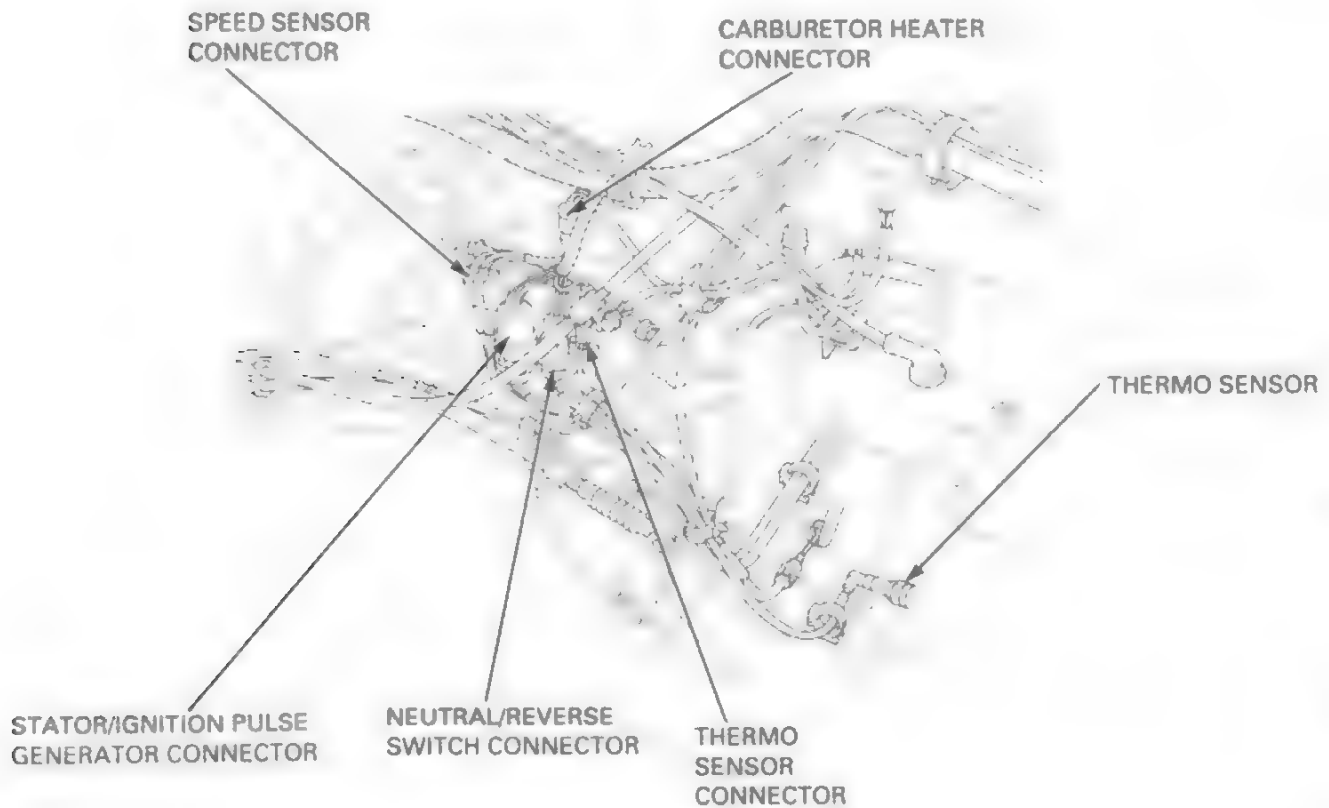
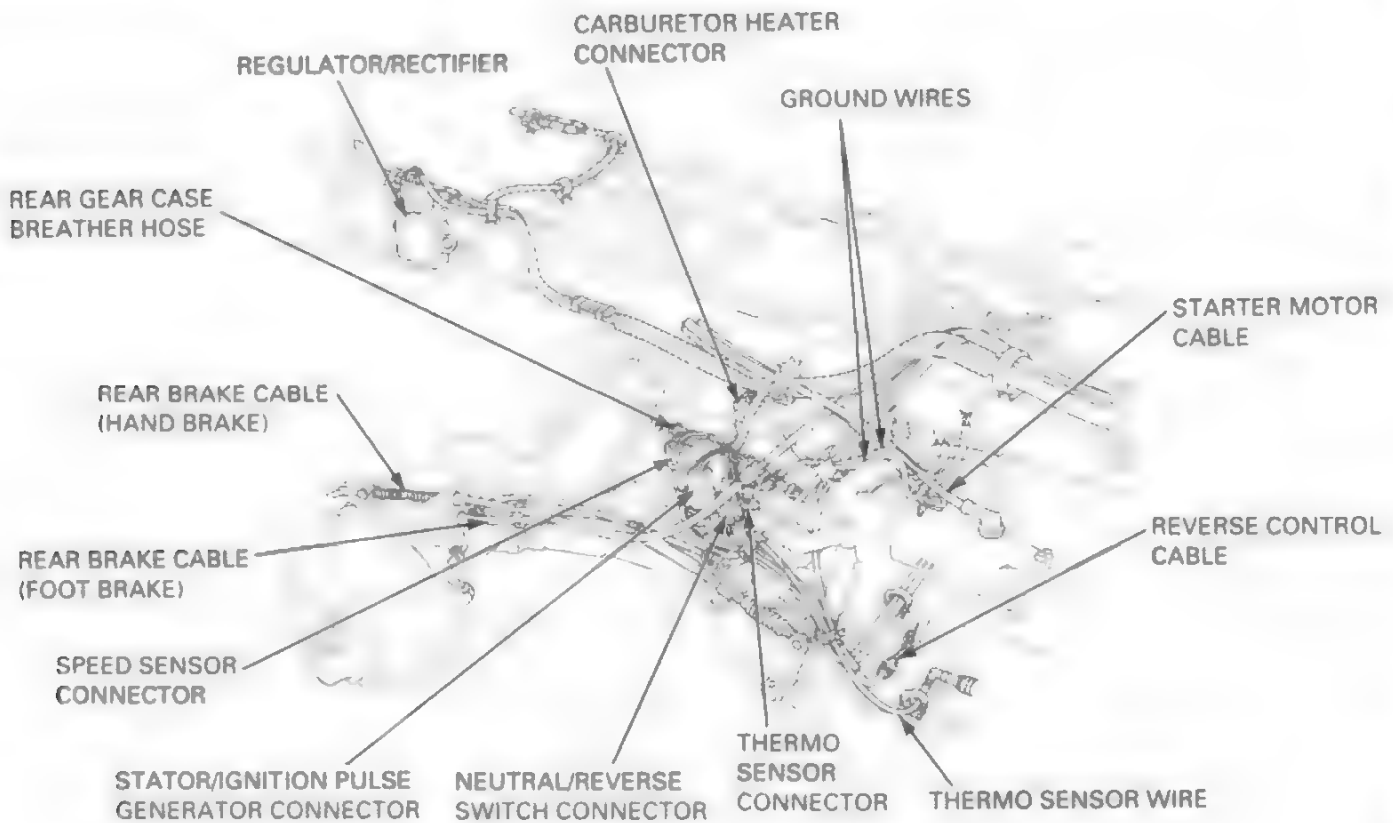


TRX450ES/FE



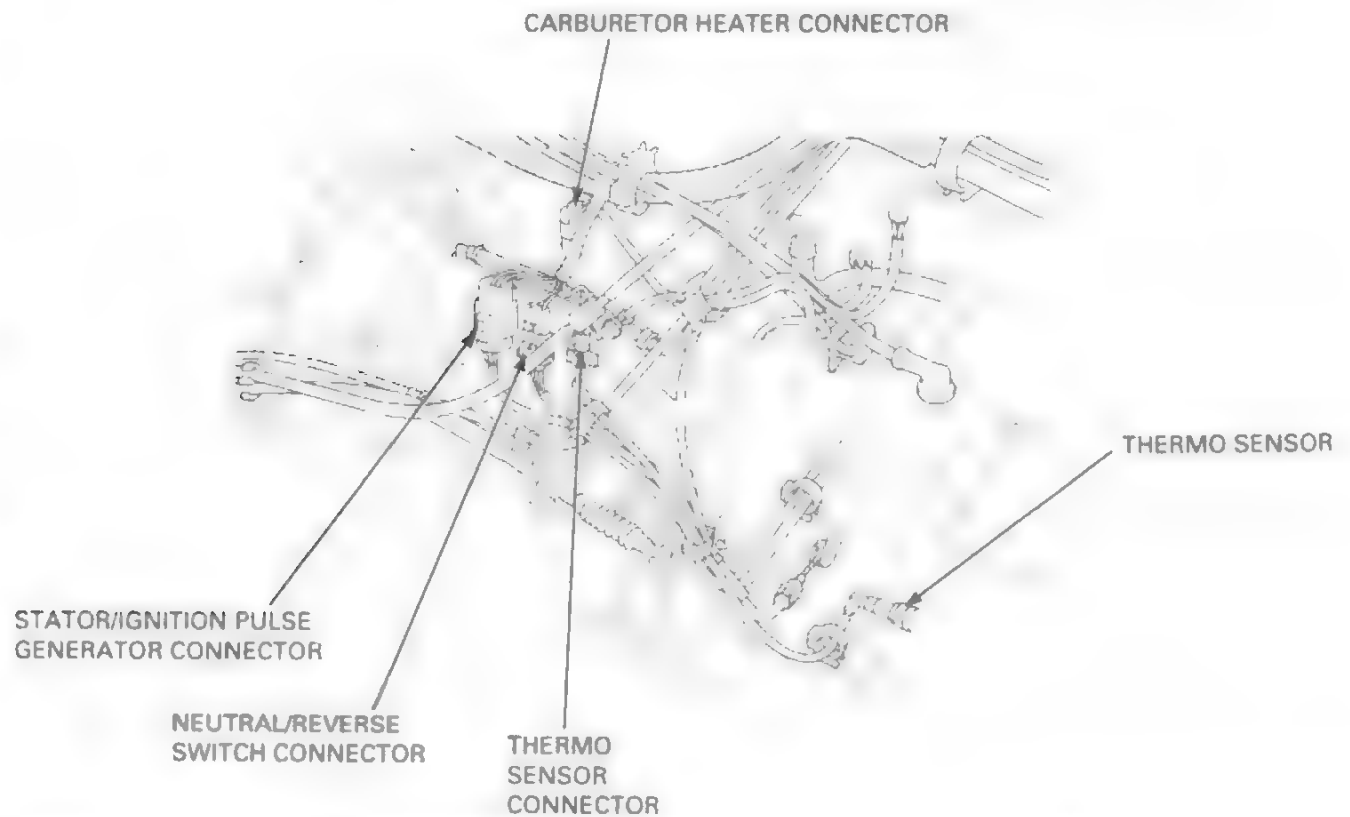
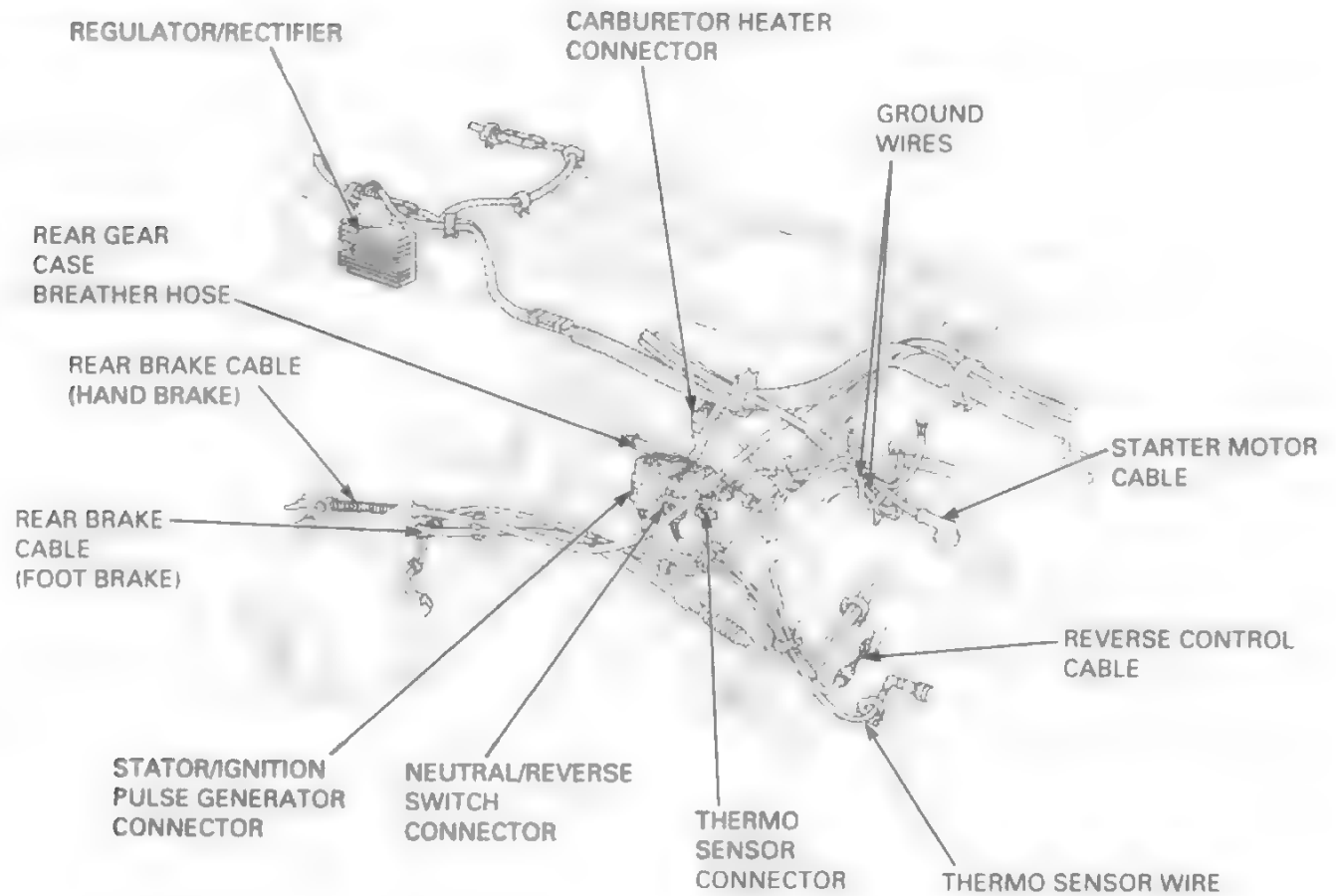
## GENERAL INFORMATION

TRX450S ('98-'01):



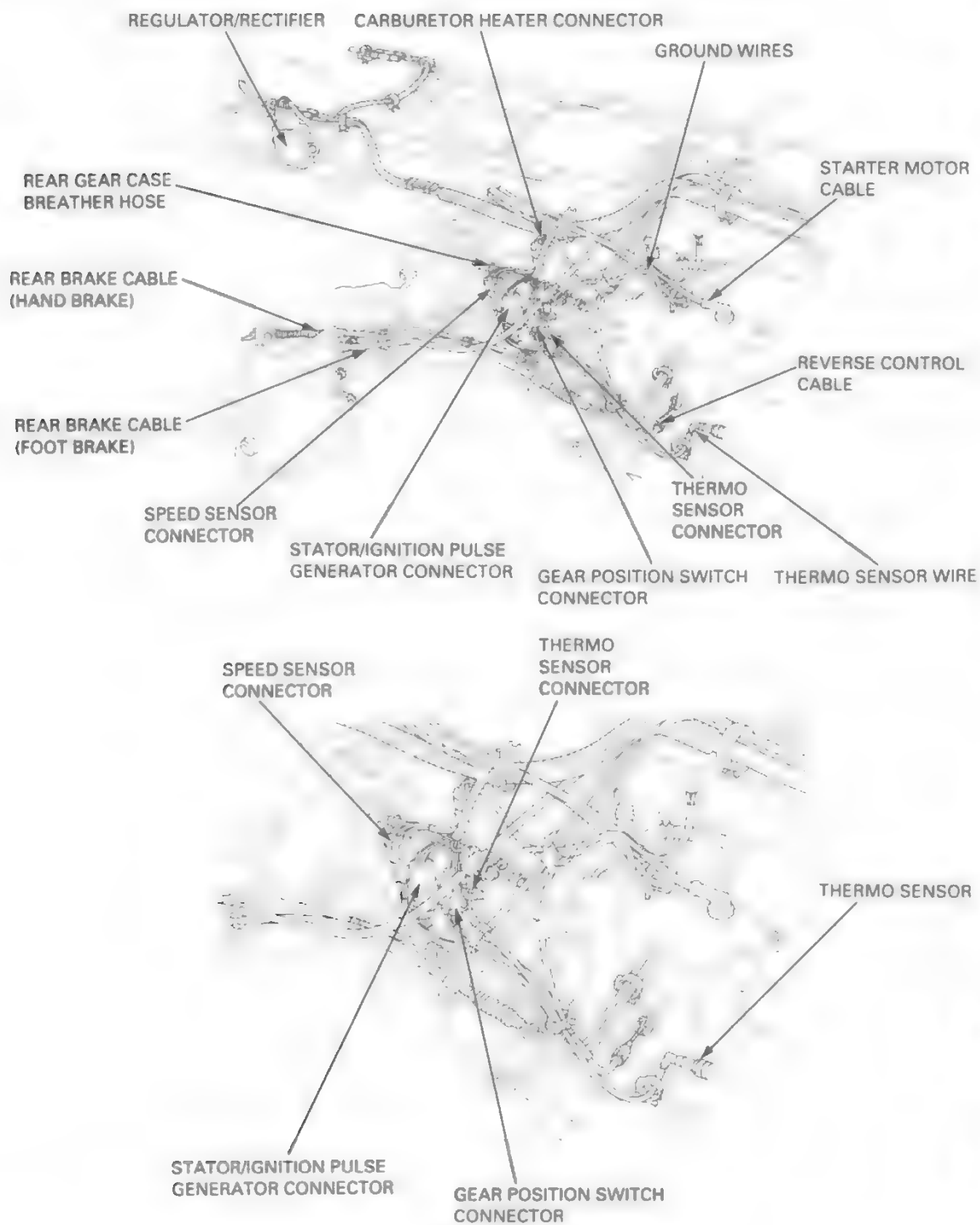


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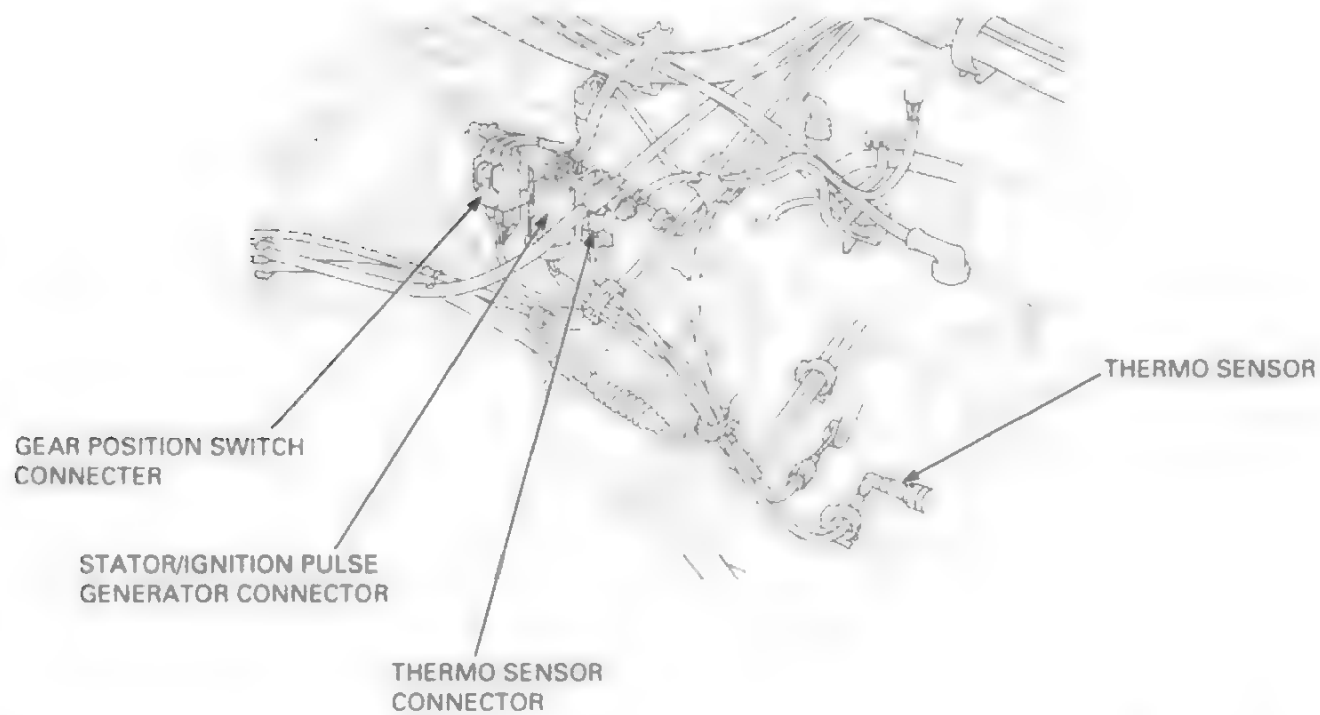
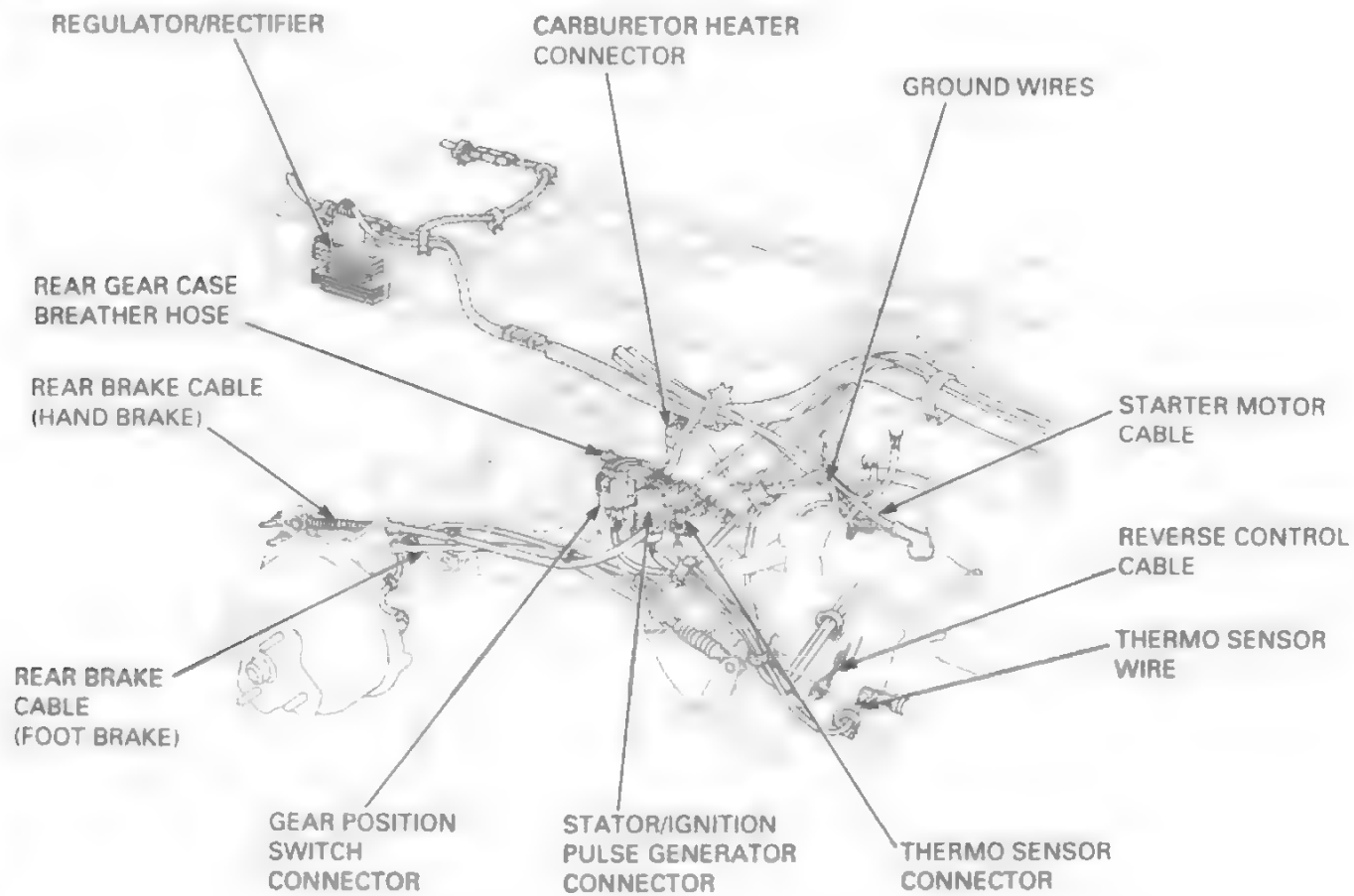


## GENERAL INFORMATION

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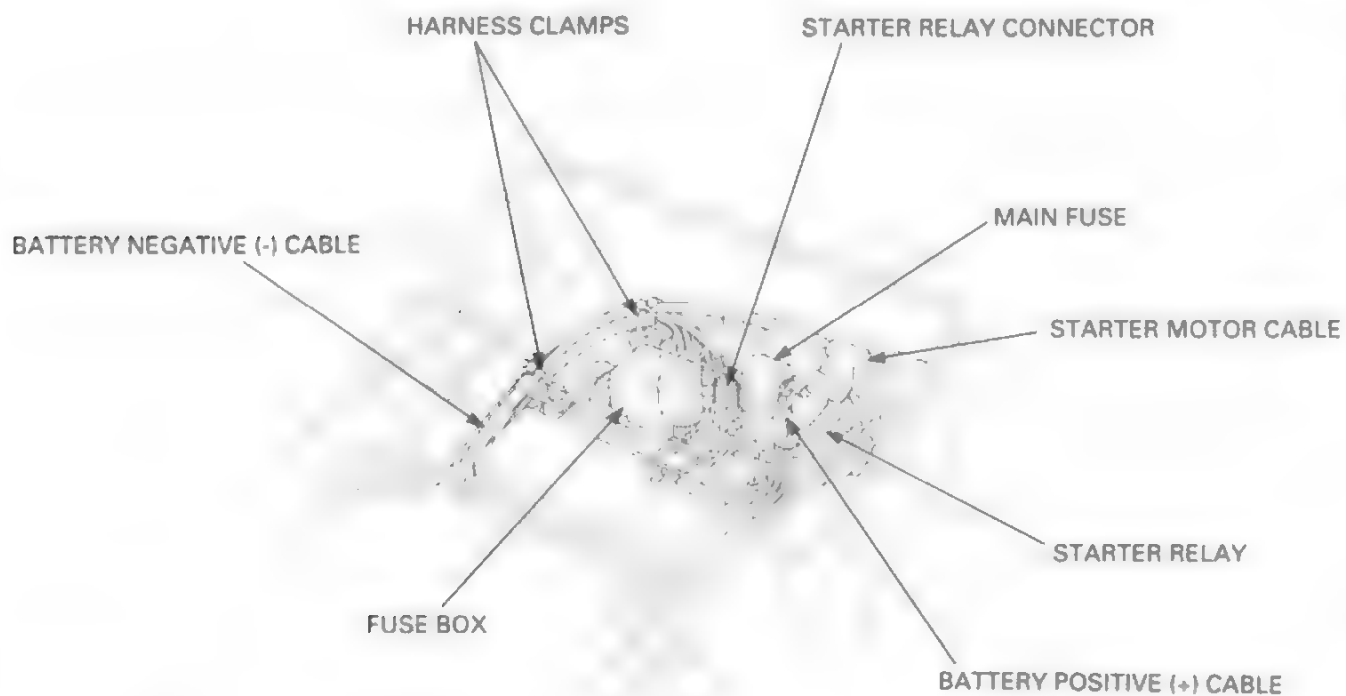


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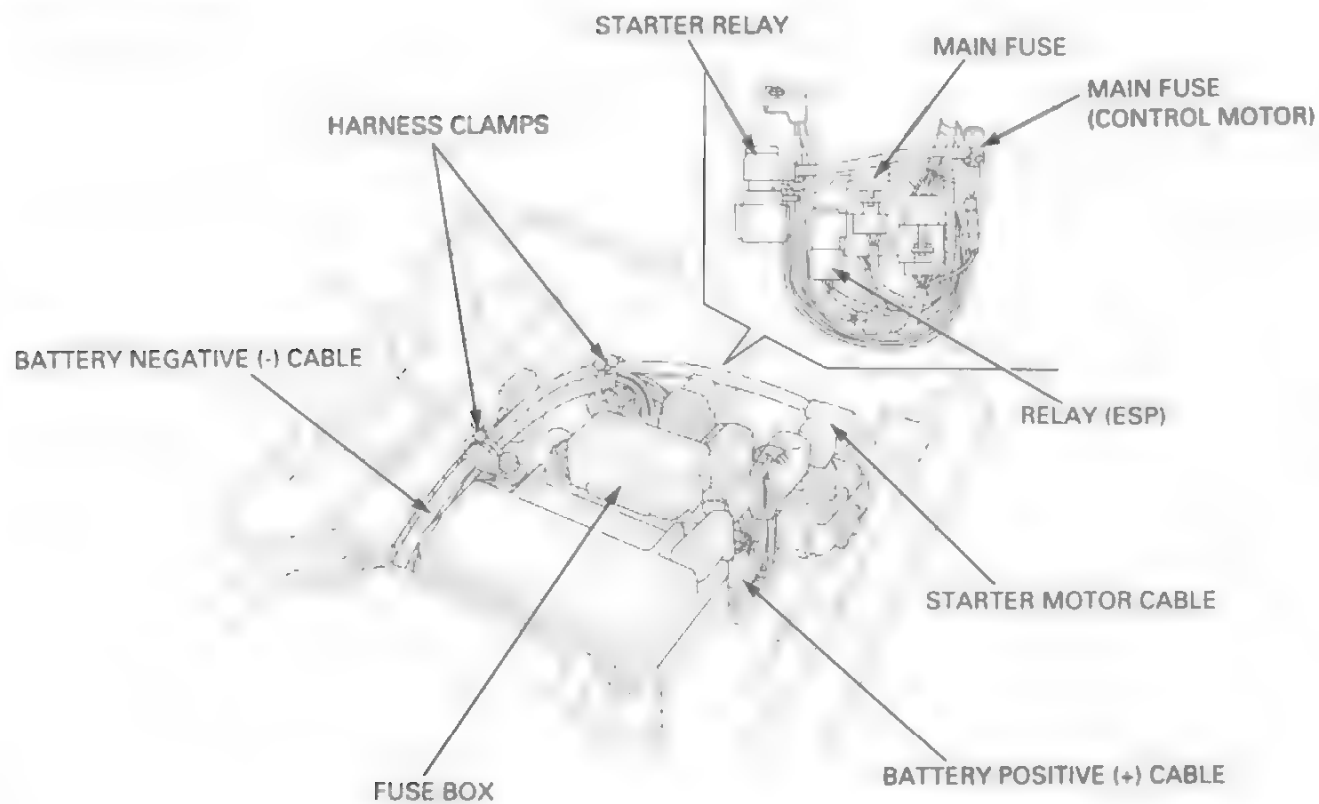


## GENERAL INFORMATION

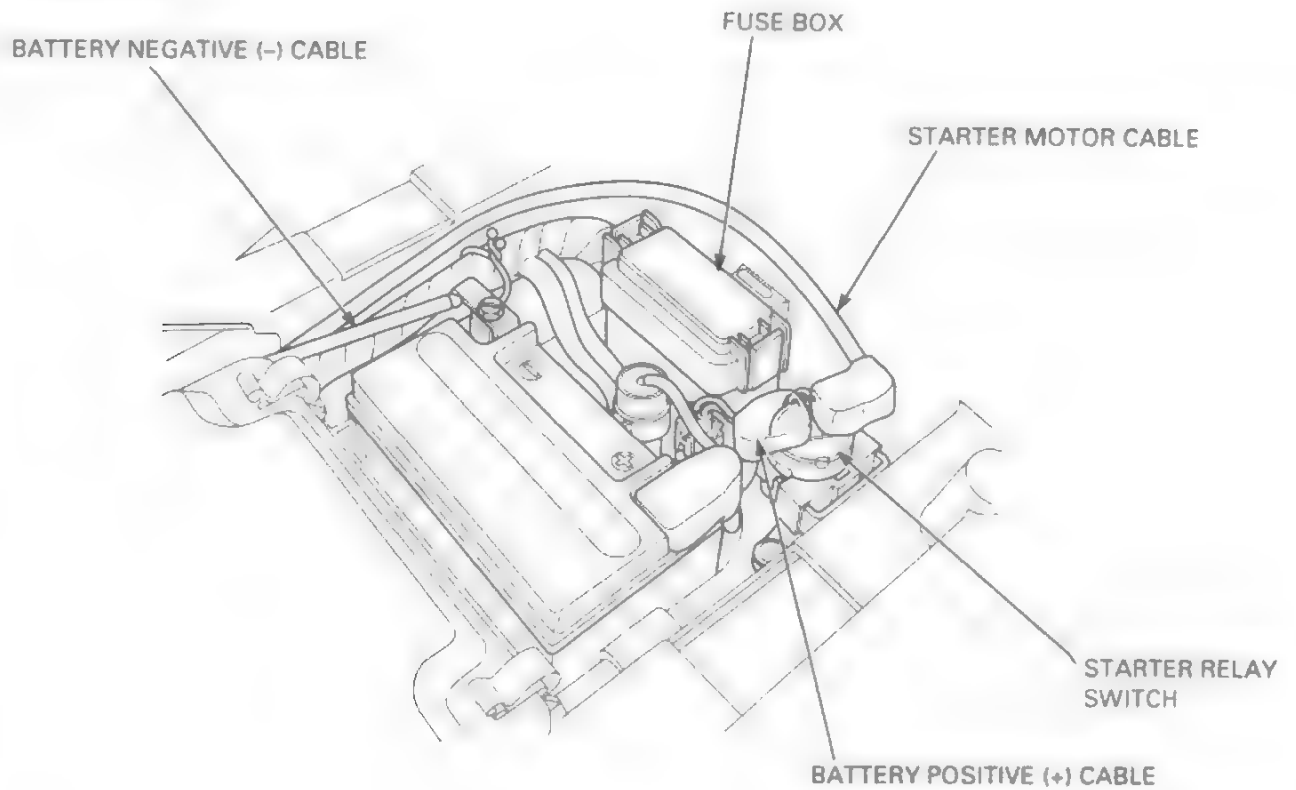
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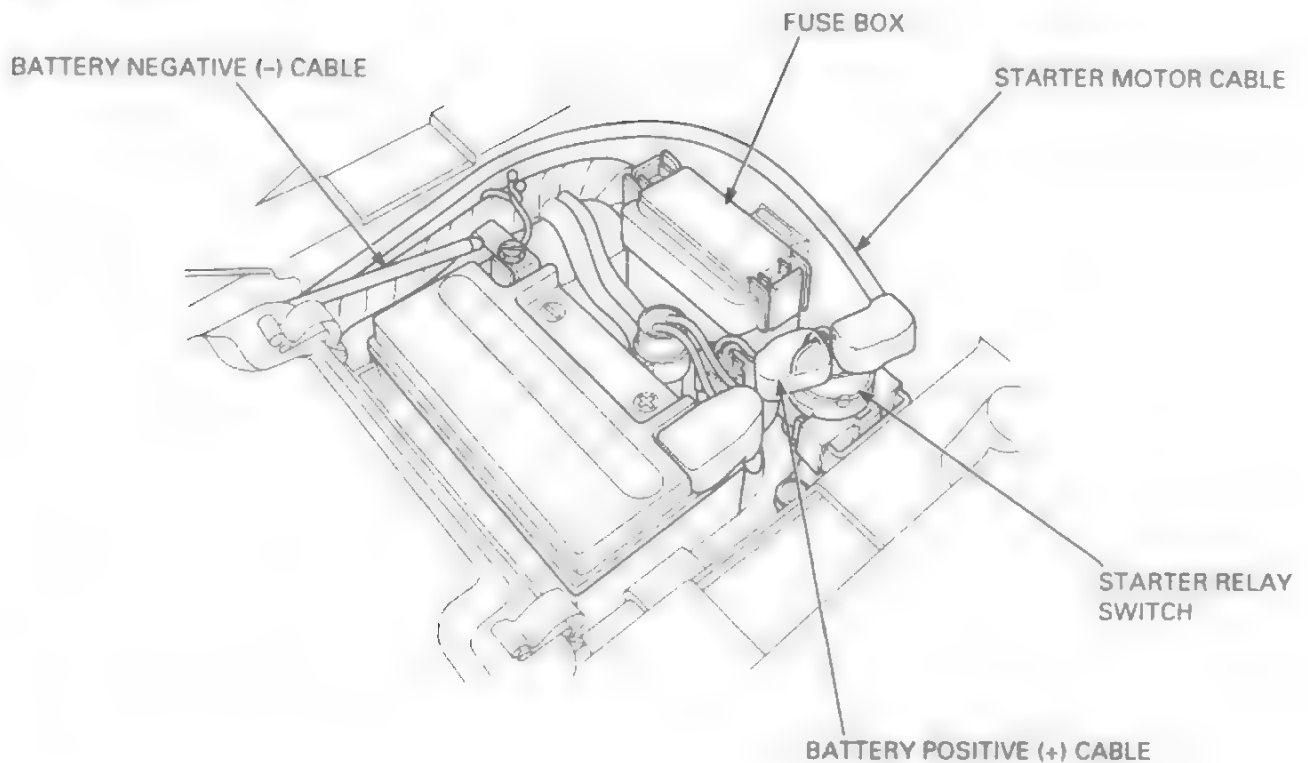
TRX450ES ('98-'01):



TRX450FM (After '01):



TRX450FE (After '01):



## GENERAL INFORMATION

### EMISSION CONTROL SYSTEMS

The California Air Resources Board (CARB) requires manufacturers to certify that their ATVs comply with applicable exhaust emissions standards during their useful life, when operated and maintained according to the instructions provided.

#### SOURCE OF EMISSIONS

The combustion process produces carbon monoxide and hydrocarbons. Control of hydrocarbons is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

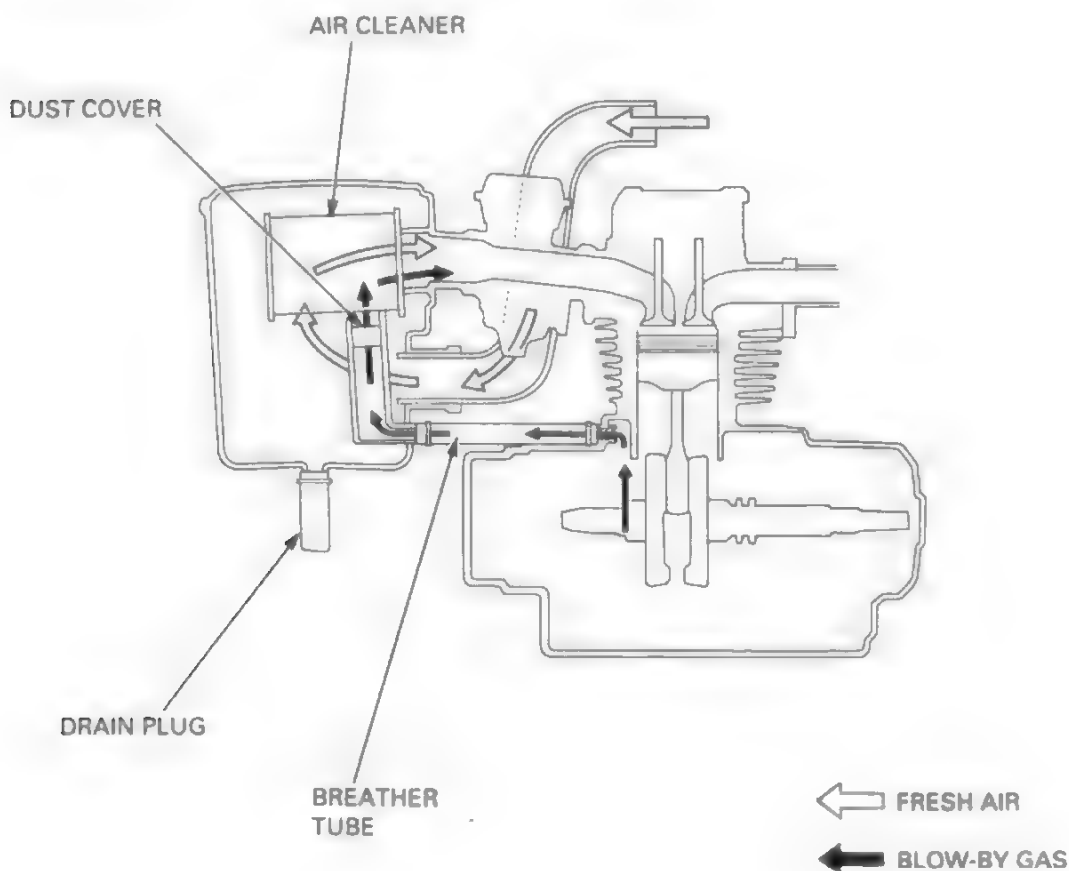
Honda Motor Co., Ltd. utilized lean carburetor settings as well as other systems, to reduce carbon monoxide and hydrocarbons.

#### EXHAUST EMISSION CONTROL SYSTEM

The exhaust emission control system is composed of a lean carburetor setting, and no adjustments should be made except idle speed adjustment with the throttle stop screw. The exhaust emission control system is separate from the crankcase emission control system.

#### CRANKCASE EMISSION CONTROL SYSTEM

The engine is equipped with a closed crankcase system to prevent discharging crankcase emissions into the atmosphere. Blow-by gas is returned to the combustion chamber through the air cleaner and carburetor.





## **NOISE EMISSION CONTROL SYSTEM**

**TAMPERING WITH THE NOISE CONTROL SYSTEM IS PROHIBITED:** U.S. federal law prohibits or Canadian provincial laws prohibit the following acts or the causing thereof: (1) The removal or rendering inoperative by any person, other than for purposes of maintenance, repair or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use; or (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

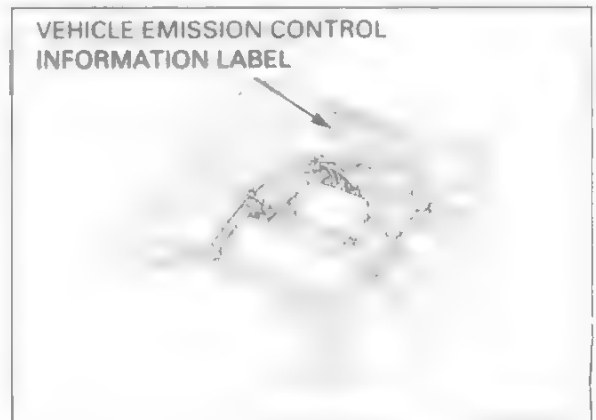
**AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE ACTS LISTED BELOW:**

1. Removal of, or puncturing of the muffler, baffles, header pipes or any other component which conduct exhaust gases.
2. Removal of, or puncturing of any part of the intake system.
3. Lack of proper maintenance.
4. Replacing any moving parts of the vehicle, or parts of the exhaust or intake system, with parts other than those specified by the manufacturer.

## **EMISSION CONTROL INFORMATION LABEL**

The Vehicle Emission Control Information Label is attached on the rear fender.

**VEHICLE EMISSION CONTROL  
INFORMATION LABEL**

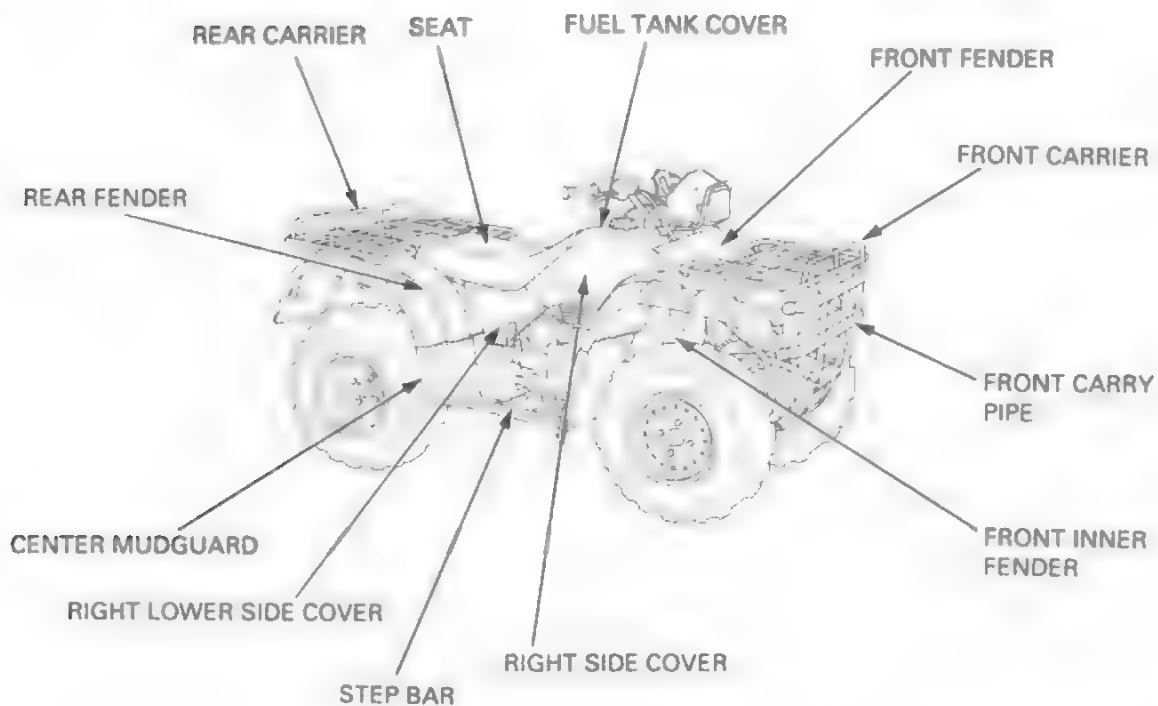


## BODY PANEL LOCATIONS

### TRX450S/FM:



### TRX450ES/FE:



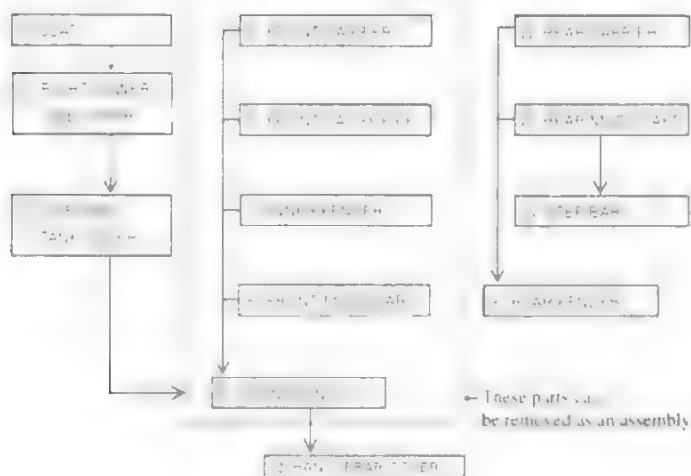
# 2. FRAME/BODY PANELS/EXHAUST SYSTEM

BODY PANEL LOCATIONS	2-0	REAR CARRIER/REAR FENDER	2-10
FRAME COVER REMOVAL CHART	2-1	HANDLEBAR COVER	2-13
SERVICE INFORMATION	2-2	CENTER MUDGUARD (TRX450ES/FE)	2-14
TROUBLESHOOTING	2-2	EXHAUST SYSTEM	2-15
SEAT/SIDE COVER	2-3		
FRONT CARRIER/CARRY PIPE /FENDER	2-6		

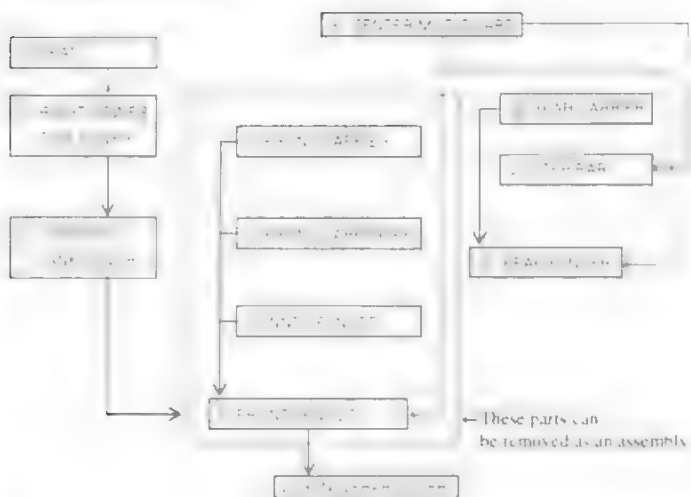
2

## FRAME COVER REMOVAL CHART

### TRX450S/FM:



### TRX450ES/FE:



SERVICE INFORMATION

GENERAL

⚠ WARNING

- Gasoline is extremely flammable and is explosive under certain conditions. **KEEP OUT OF REACH OF CHILDREN.**
  - Serious burns may result if the exhaust system is not allowed to cool before components are removed or serviced.
- 
- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.
  - This section covers removal and installation of the body panels and exhaust system.
  - Always replace the exhaust pipe gaskets after removing the exhaust pipe from the engine.
  - When installing the exhaust system, loosely install all of the exhaust pipe fasteners. Always tighten the exhaust clamps first, then tighten the mounting fasteners. If you tighten the mounting fasteners first, the exhaust pipe may not seat properly.
  - Always inspect the exhaust system for leaks after installation.

TORQUE VALUES

Muffler band bolt	23 N•m (2.3 kgf•m, 17 lbf•ft)
Exhaust pipe protector bolt	22 N•m (2.2 kgf•m, 16 lbf•ft)
Muffler heat protector bolt	22 N•m (2.2 kgf•m, 16 lbf•ft)
Step bar mounting bolt	32 N•m (3.3 kgf•m, 24 lbf•ft)
Fuel tank rear bracket bolt	18 N•m (1.8 kgf•m, 13 lbf•ft)
Front and rear carrier mounting bolt:	
'98 - '01:	32 N•m (3.3 kgf•m, 24 lbf•ft)
After '01:	37 N•m (3.8 kgf•m, 27 lbf•ft)

TROUBLESHOOTING

Excessive exhaust noise

- Broken exhaust system
- Exhaust gas leak

Poor performance

- Deformed exhaust system
- Exhaust gas leak
- Clogged muffler

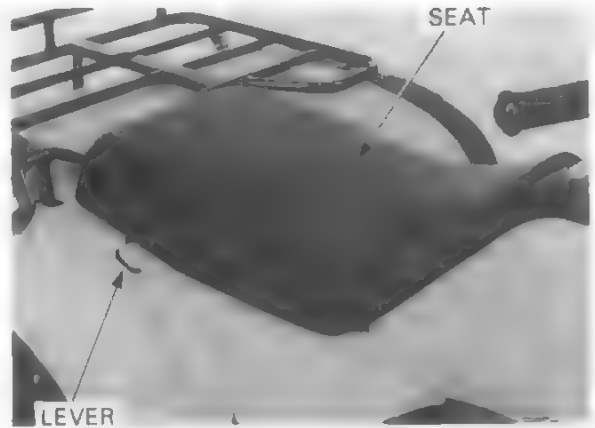
## SEAT/SIDE COVER

### REMOVAL

#### Seat

Release the seat lock lever by moving the lever upward.

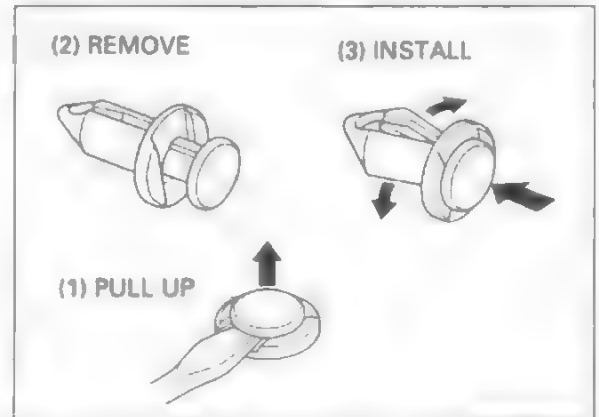
Pull back and remove the seat.



#### Retaining Clip

Remove the retaining clips as follow:

- Pull up the clip center using a snap ring pliers, flat head screwdriver or equivalent.
- Remove the clip assembly



#### Side Covers And Fuel Tank Cover

Remove the fuel tank breather tube from the handlebar cover.

#### ⚠ WARNING

**Gasoline is extremely flammable and explosive under certain conditions. KEEP OUT OF-REACH OF CHILDREN.**

Remove the fuel tank cap by turning it counterclockwise.

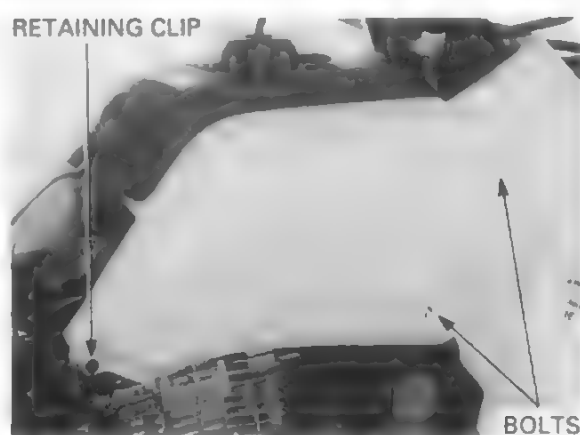
Remove the two retaining clips.

Remove the right lower side cover by releasing the tabs from the frame grommets.

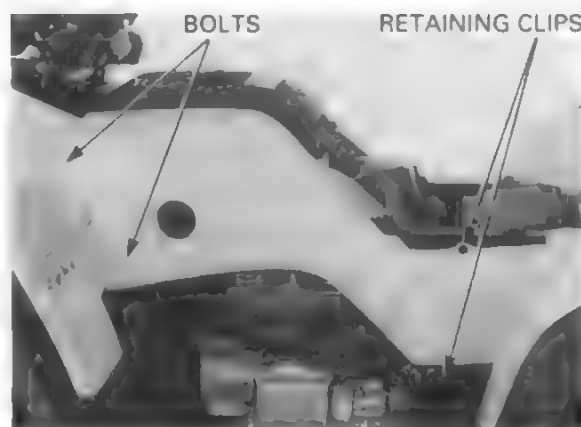


## FRAME/BODY PANELS/EXHAUST SYSTEM

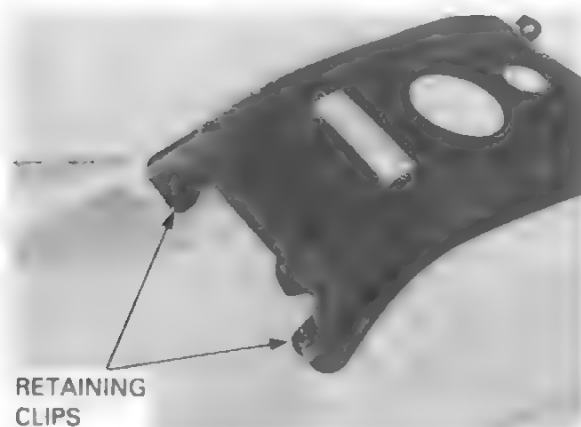
Remove the two right side cover mounting bolts and retaining clip.



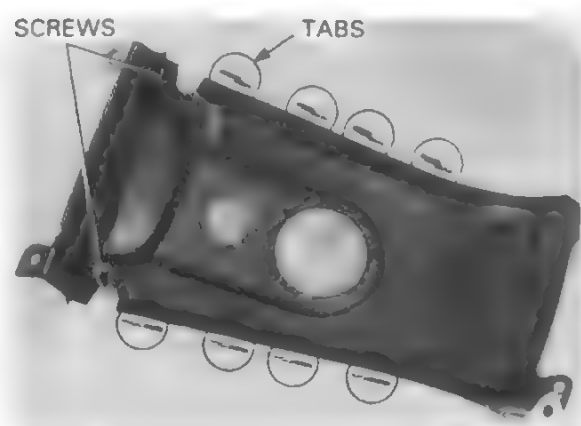
Remove the two left side cover mounting bolts and two retaining clips, then remove the side/fuel tank cover as an assembly.

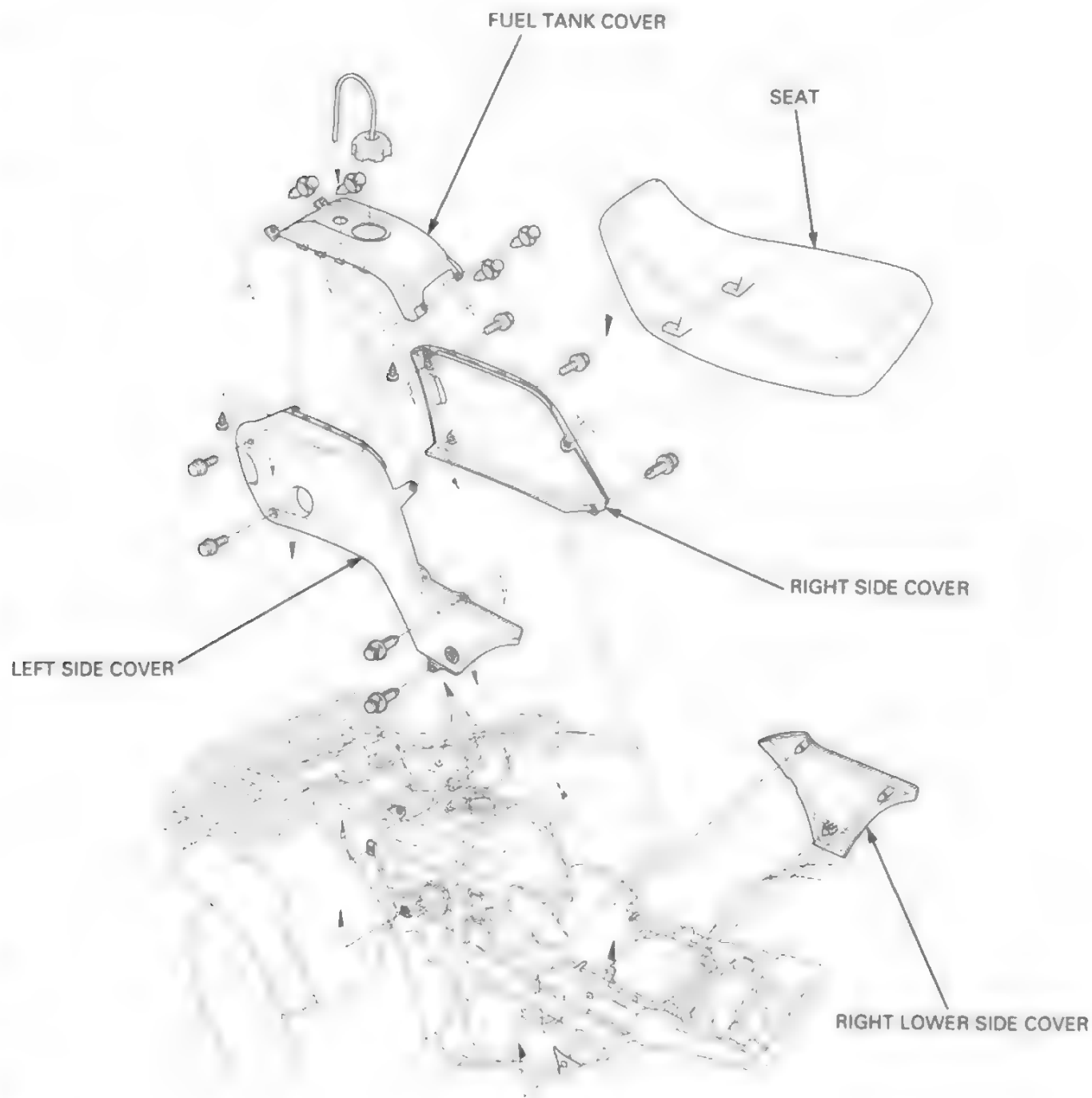


**Side/Fuel Tank Cover Separation**  
Remove the two retaining clips.



Remove the two screws.  
Release the eight tabs from the both side cover by sliding rearward then separate the side/fuel tank cover.





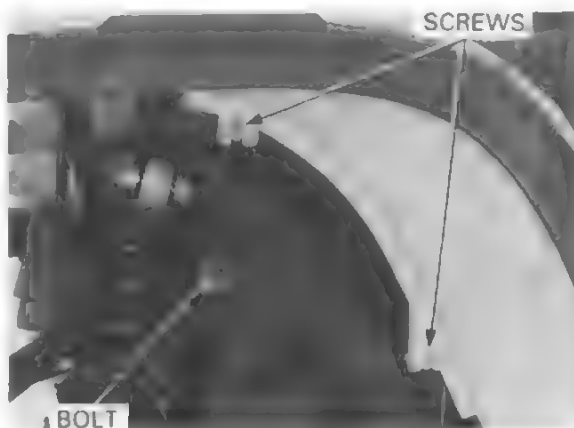


## FRONT CARRIER/CARRY PIPE/FRONT FENDER

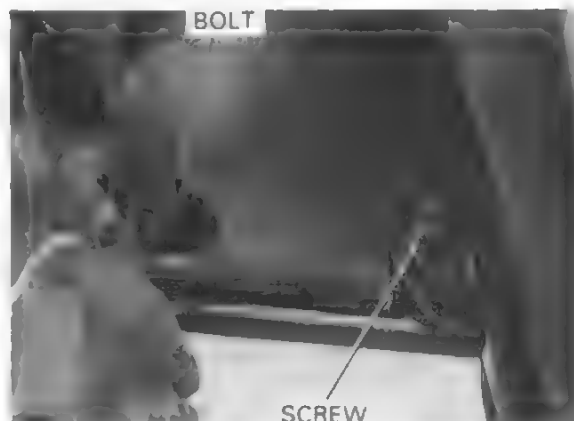
### REMOVAL

Remove the side/fuel tank cover assembly (page 2-3).

Loosen the two screws and remove the bolt on each side.



Remove the screw and bolt then remove the inner fender on each side.



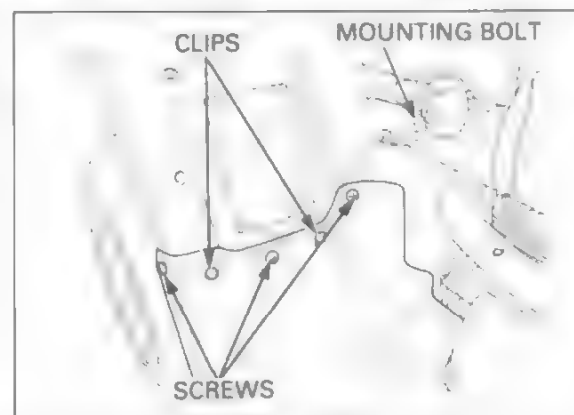
TRX450S/FM

Remove the front fender/mud guard stay screw on each side.  
Remove the front fender rear mounting bolt on each side.

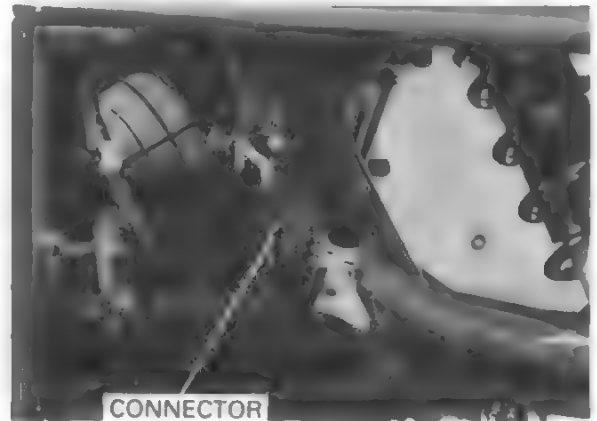


TRX450ES/FE

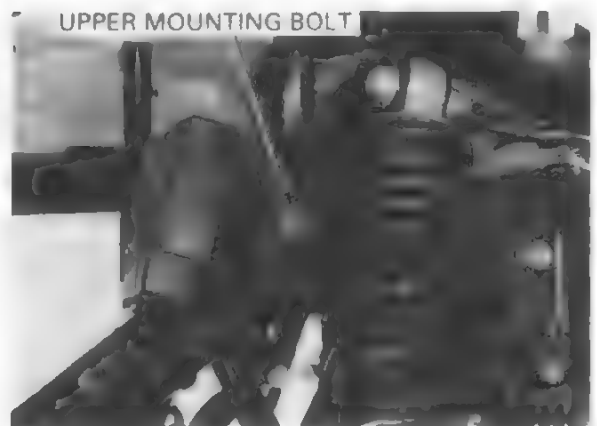
Remove the front fender/center mudguard stay screws and retaining clips, on each side.  
Remove the front fender rear mounting bolt on each side.



Disconnect the headlight connector.



Remove the upper mounting bolts on each side.

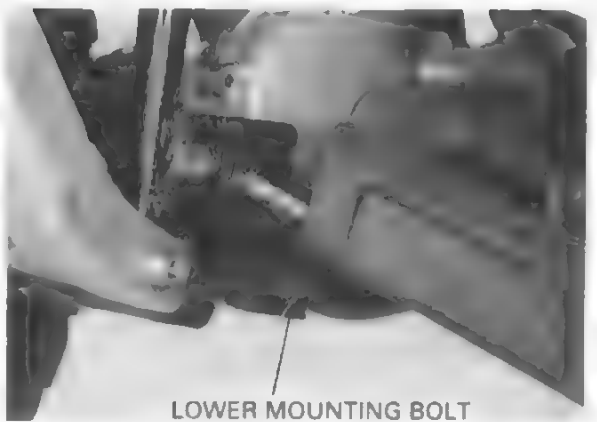


Remove the middle mounting bolts on each side.

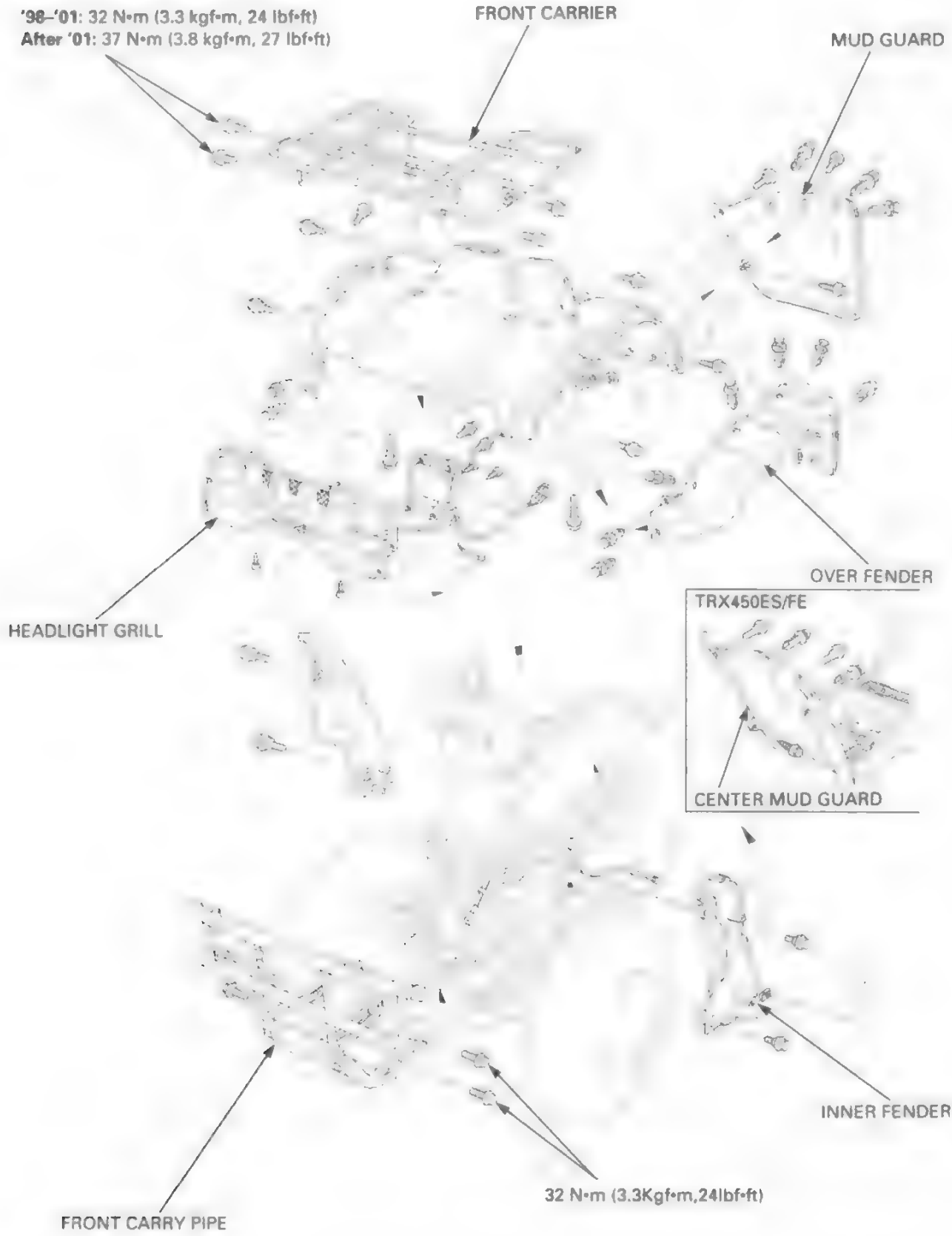


Remove the lower mounting bolts on each side.

Remove the front fender, carry pipe and front carrier as an assembly.



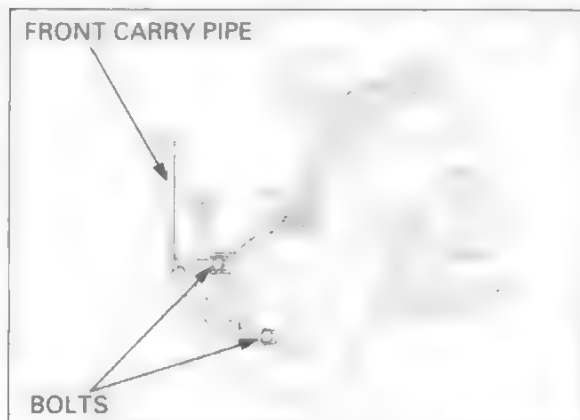
DISASSEMBLY



Install the front carry pipe and loosely tighten the mounting bolts.

**NOTE:**

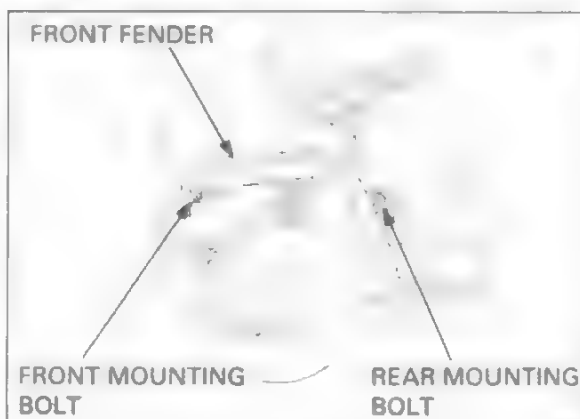
Do not tighten them yet.



Install the front fender.  
Install the front and rear mounting bolts, then tighten the rear mounting bolts.

**NOTE:**

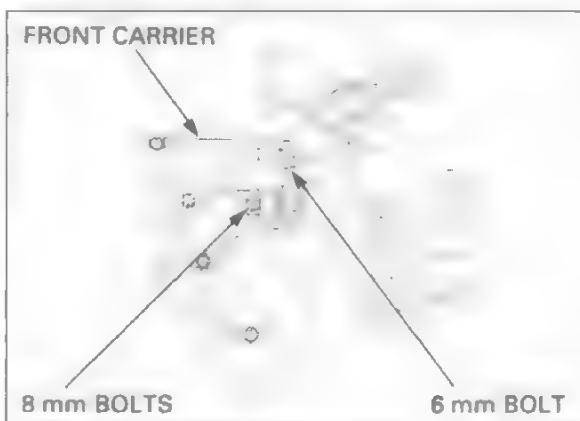
Do not tighten the front bolts yet.



Install the front carrier and mounting bolts.  
Tighten the front carry pipe and carrier 8 mm bolts to the specified torque.

**TORQUE:** '98 - '01: 32 N·m (3.3 kgf·m, 24 lbf·ft)  
After '01: 37 N·m (3.8 kgf·m, 27 lbf·ft)

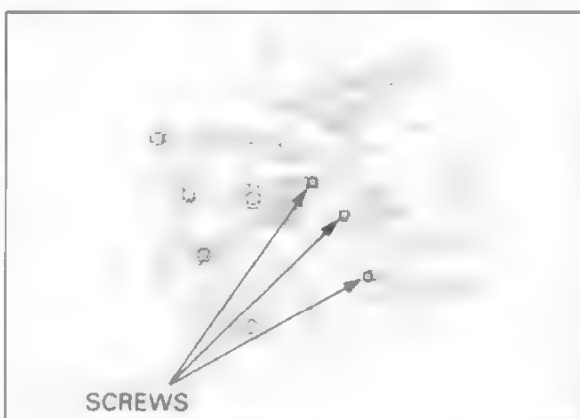
Install and tighten the front carrier 6 mm bolts.



Tighten the front mounting bolts.  
Install and tighten the inner fender joint screws.  
Install and tighten the mud guard screws.

**NOTE:**

Note the washer locations when installing mud guard.



TRX450ES/FE · Install the retaining clips on each side.

## REAR CARRIER/REAR FENDER

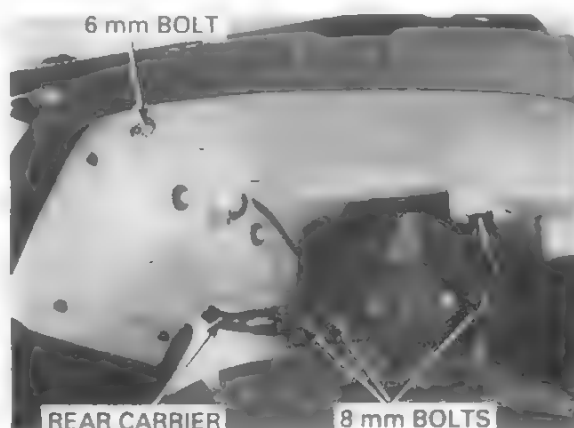
### REMOVAL

#### REAR CARRIER

Remove the two 6 mm bolts.

Remove the six 8 mm bolts and rear carrier.

*Be careful not to scratch the rear fender upon removal*



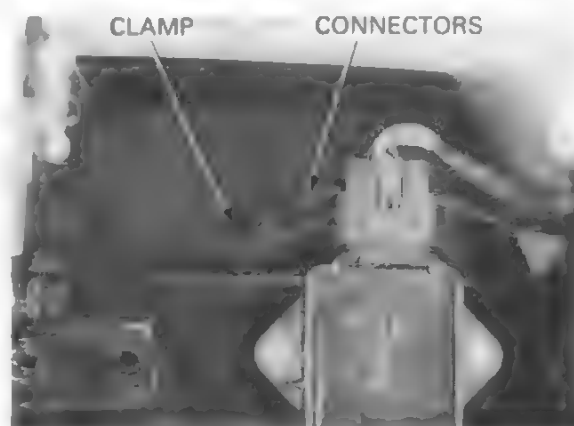
#### REAR FENDER

Remove the right lower side cover (page 2-3).

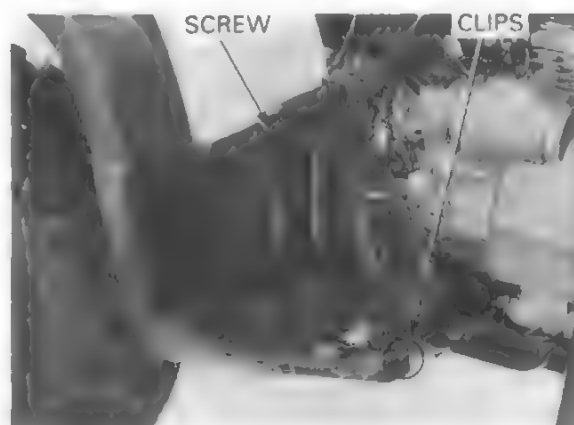
Remove the rear carrier.

Release the taillight wire clamps.

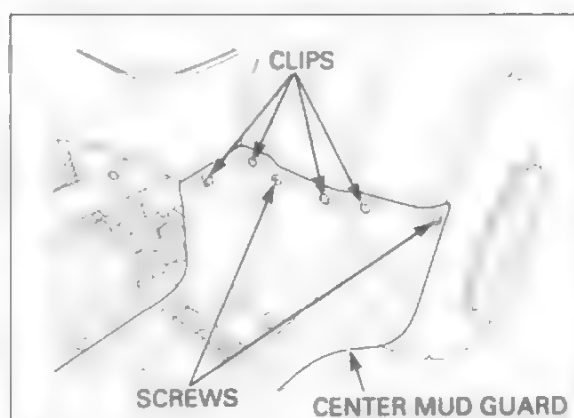
Disconnect the taillight connectors.



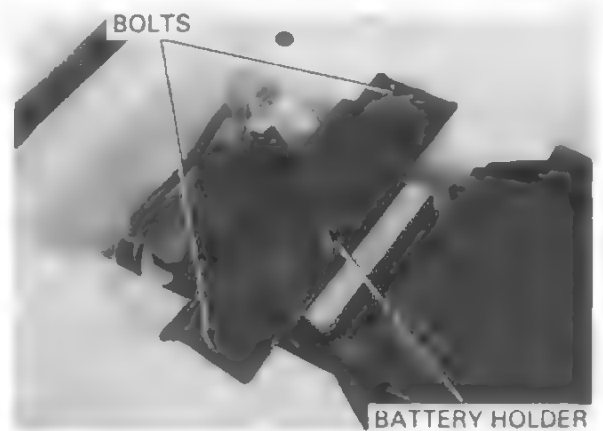
**TRX450S/FM :** Remove the mud guard stay screw on each side.  
Remove the retaining clips.



**TRX450ES/FE :** Remove the screws and four retaining clips on each side.

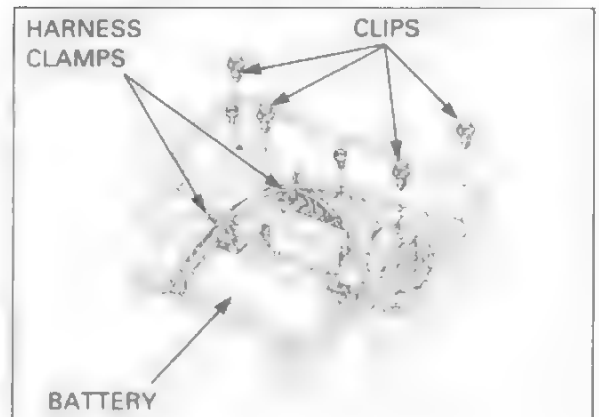


Remove the bolts and battery holder.



Remove the battery (page 17-5).

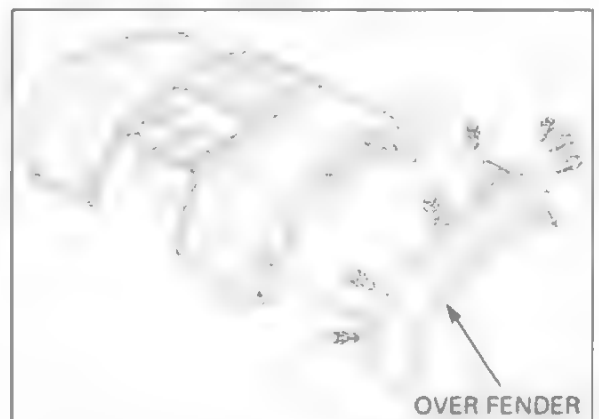
Release the wire harness clamps.  
Remove the two outer retaining clips and harness bracket assembly.  
Remove the two fender retaining clips.  
Remove the rear fender assembly.



### DISASSEMBLY

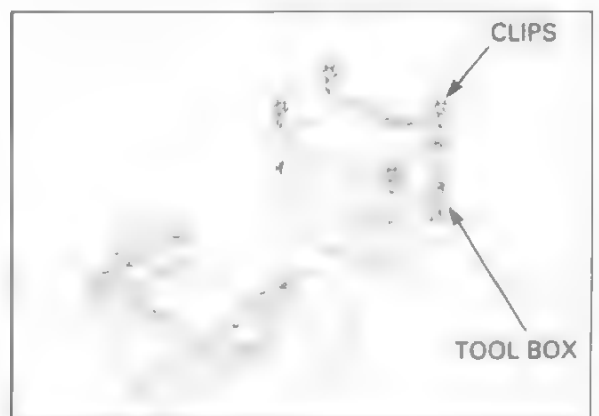
Remove the screws and taillight unit (page 20-10).

Remove the retaining clips and rear mud guard.  
Remove the retaining clips and rear over fenders.



### TOOL BOX

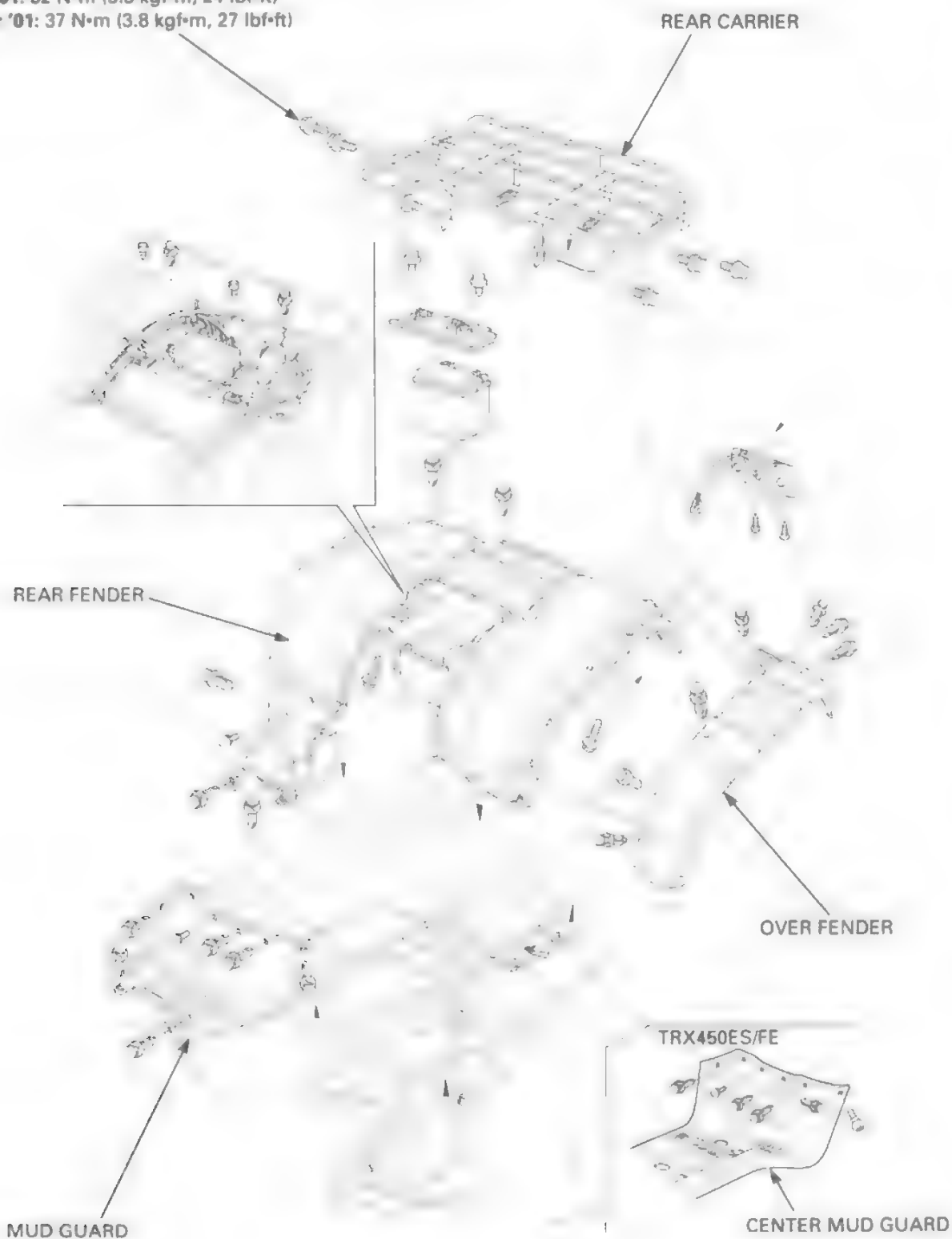
Remove the four retaining clips and tool box.



### INSTALLATION

Installation is in the reverse order of removal.

'98-'01: 32 N·m (3.3 kgf·m, 24 lbf·ft)  
After '01: 37 N·m (3.8 kgf·m, 27 lbf·ft)





## HANDLEBAR COVER

### REMOVAL

Disconnect the fuel tank breather tube from the handlebar cover.

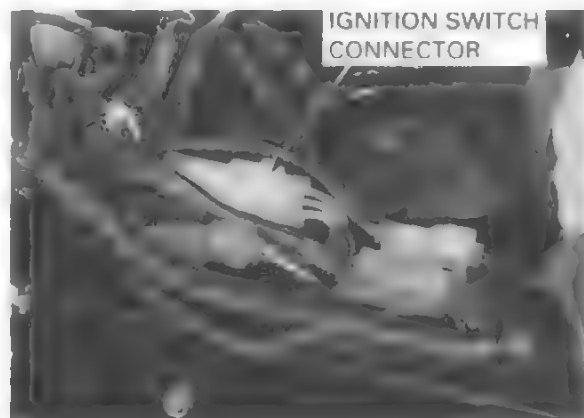
Remove the side cover (page 2-3).

Remove the front fender (page 2-6).



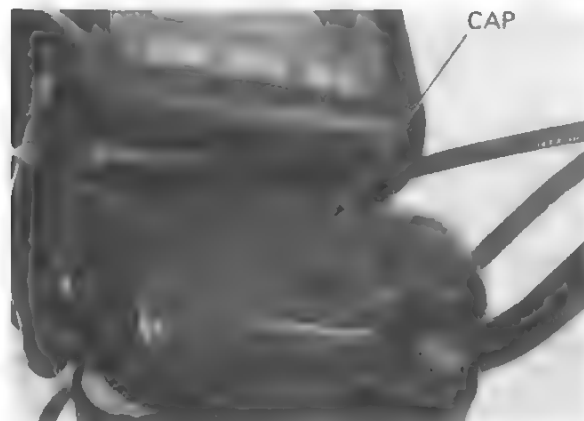
BRATHER TUBE

Disconnect the ignition switch connector.  
Release the wire clamps.



IGNITION SWITCH  
CONNECTOR

Remove the handlebar cover cap.



CAP

Remove the handlebar cover mounting screws.  
Remove the handlebar cover.



SCREWS

HANDLEBAR COVER

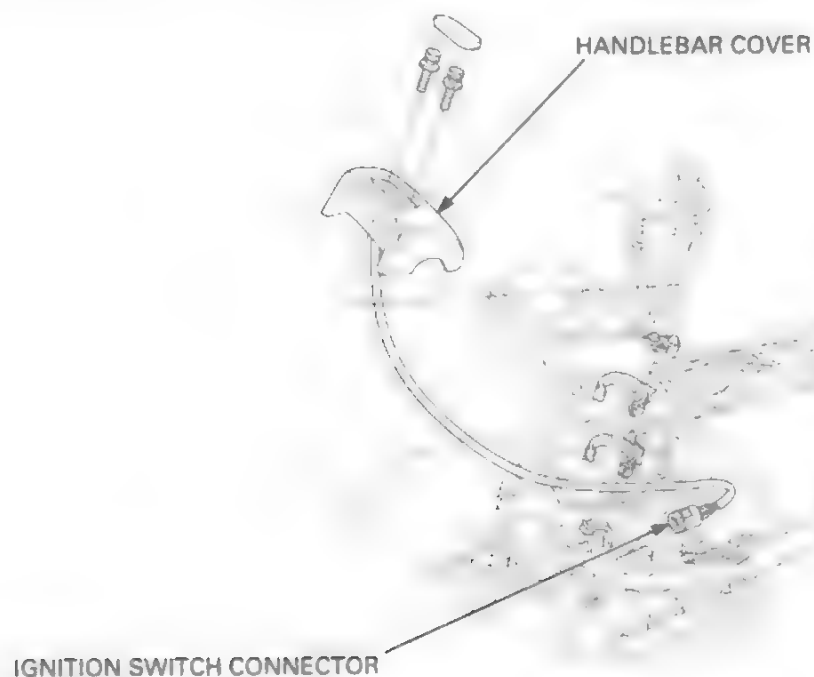
## FRAME/BODY PANELS/EXHAUST SYSTEM

### INSTALLATION

Installation is in the reverse order of removal.

#### NOTE:

At installation, install the fuel tank breather guide tube under the handlebar cover into the steering shaft hole.



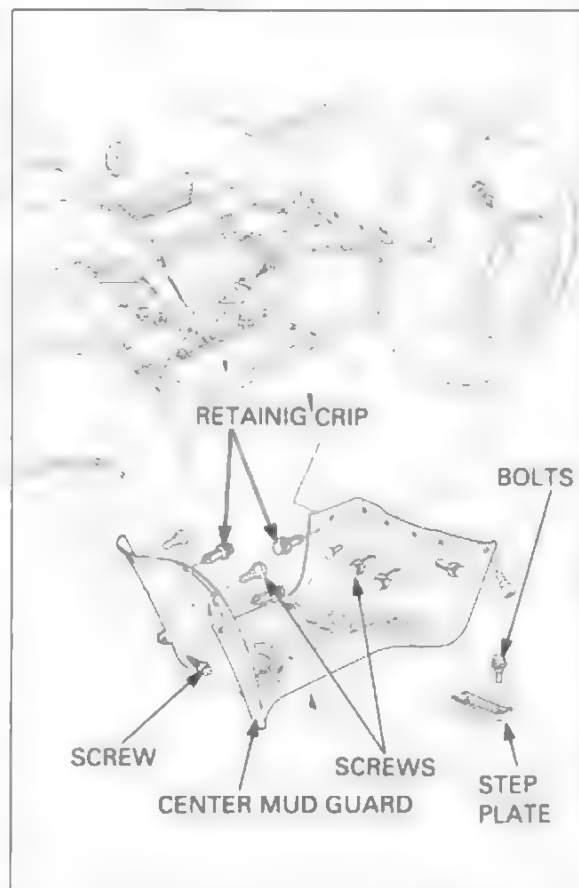
### CENTER MUD GUARD (TRX450ES/FE)

#### REMOVAL

Remove the two bolts and step plate.  
Remove the inner fender screw.  
Remove the six retaining clips and five screws then remove the floor board.

#### INSTALLATION

Installation is in the reverse order of removal.



## EXHAUST SYSTEM

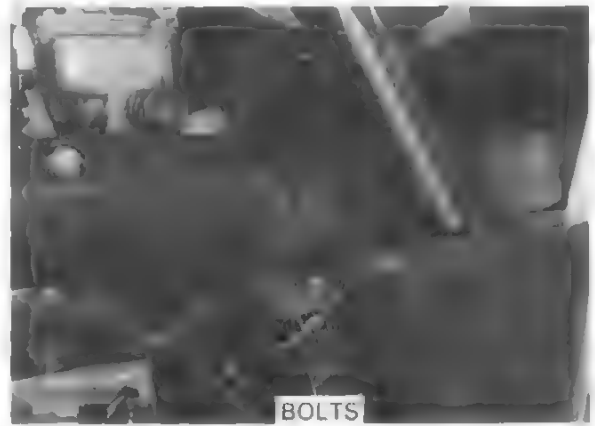
### REMOVAL

#### **⚠ WARNING**

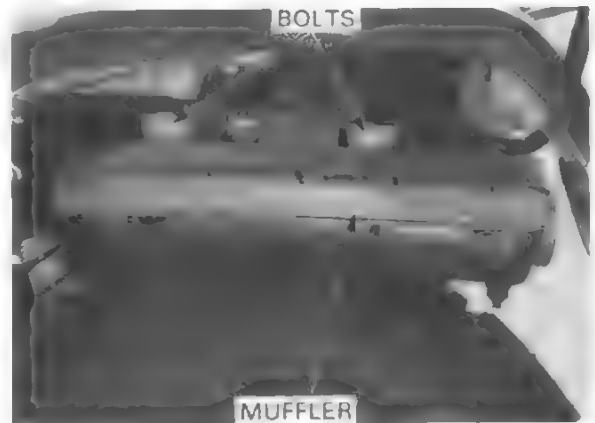
*Do not service the exhaust system while it is hot.*

#### **Muffler**

Loosen the muffler band bolts.

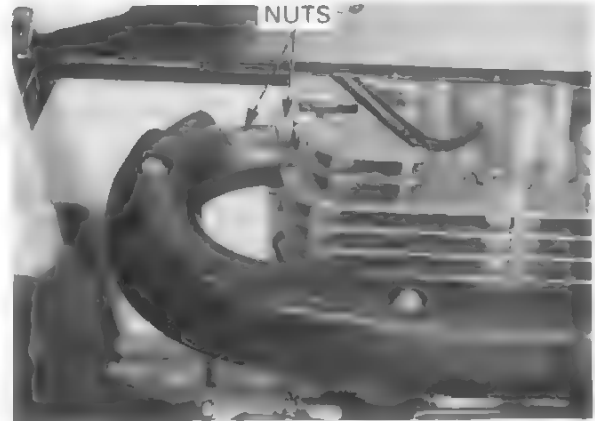


Remove the two bolts/washers, muffler and gasket.

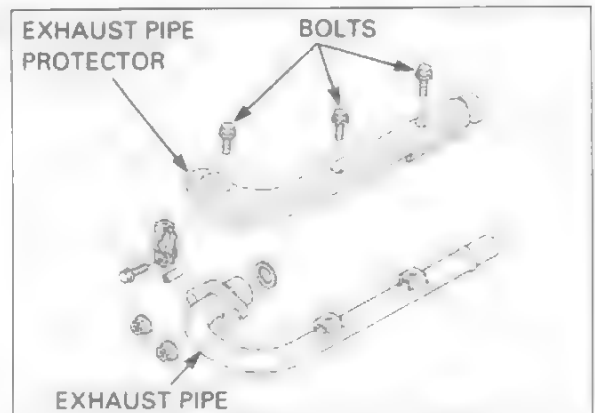


#### **Exhaust Pipe**

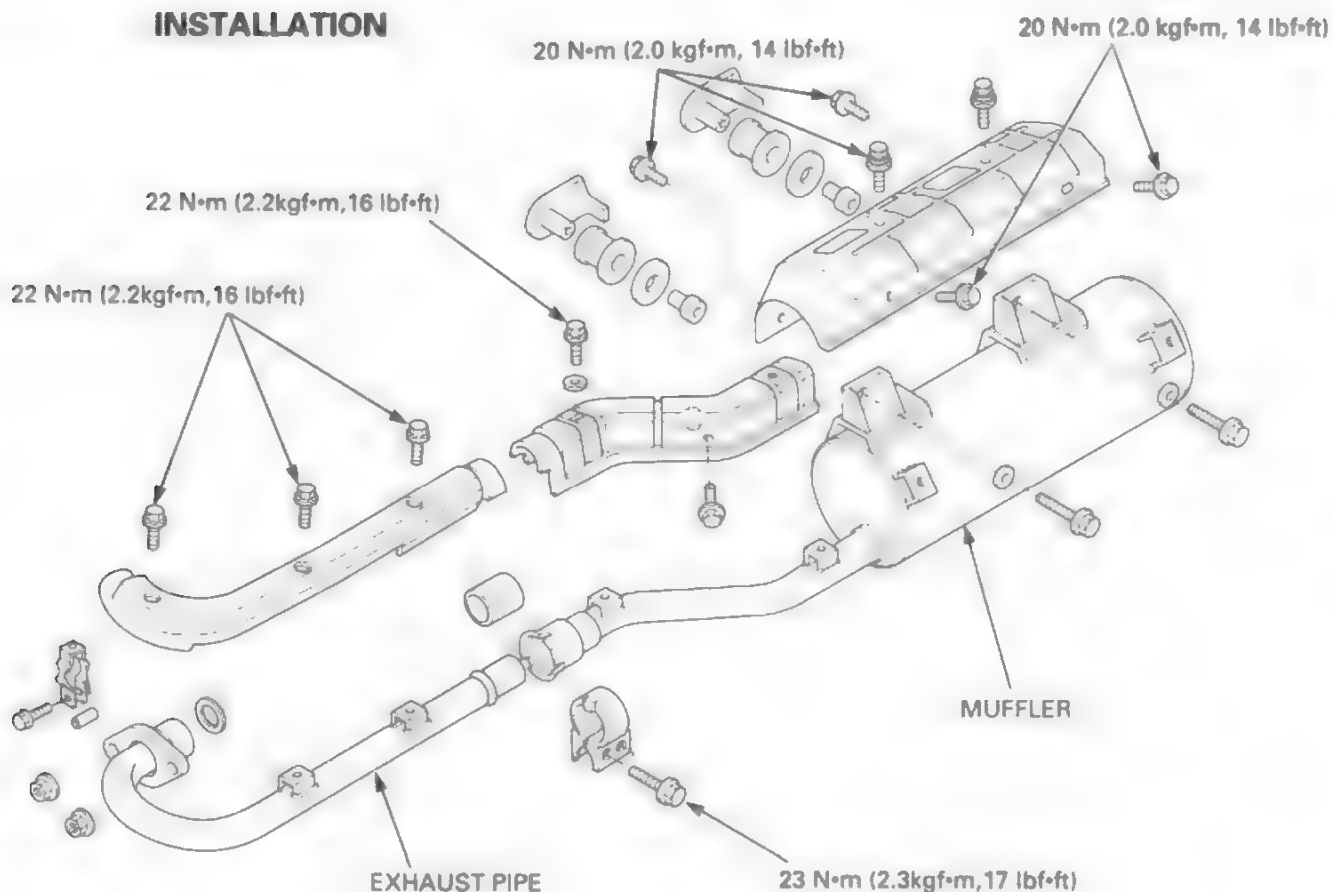
Remove the exhaust pipe joint flange nuts and exhaust pipe.



Remove the three bolts and the exhaust pipe protector.

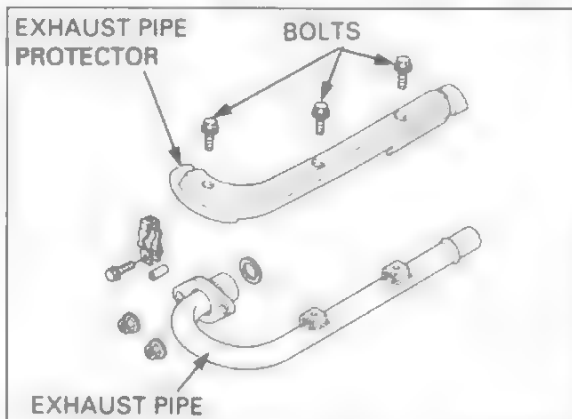


## INSTALLATION



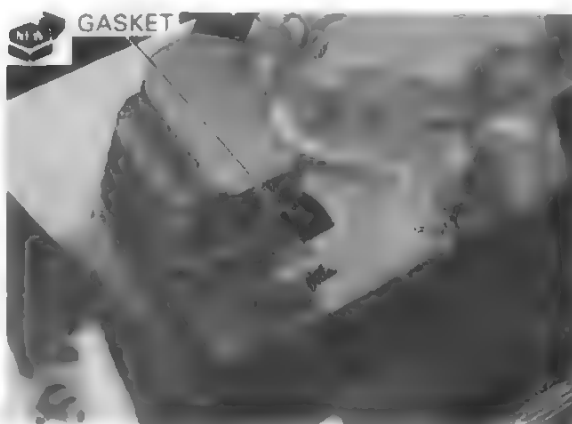
Install the exhaust pipe protector and tighten the three bolts to the specified torque.

**TORQUE: 22 N·m (2.2 kgf·m , 16 lbf·ft)**

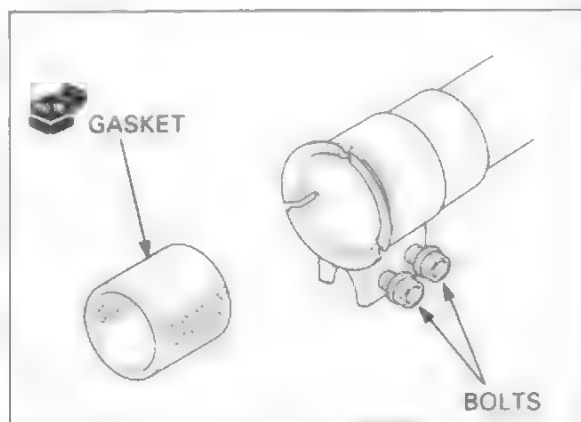


Install the new gasket to the cylinder head.

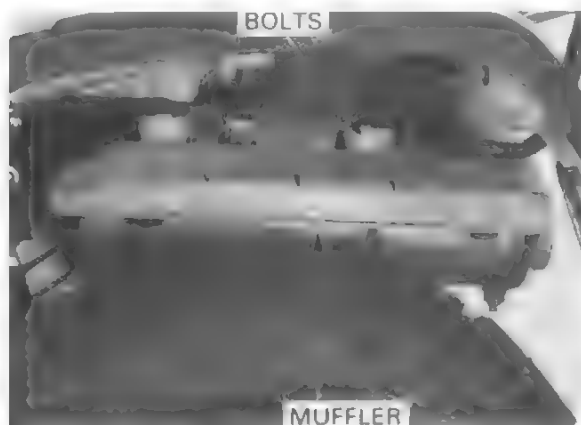
Install the exhaust pipe and tighten the flange nut loosely.



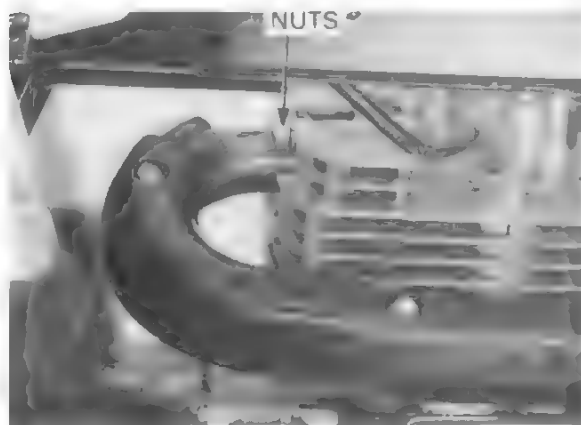
Install the new muffler gasket and flange bolts loosely.



Install the two bolts/washers loosely.

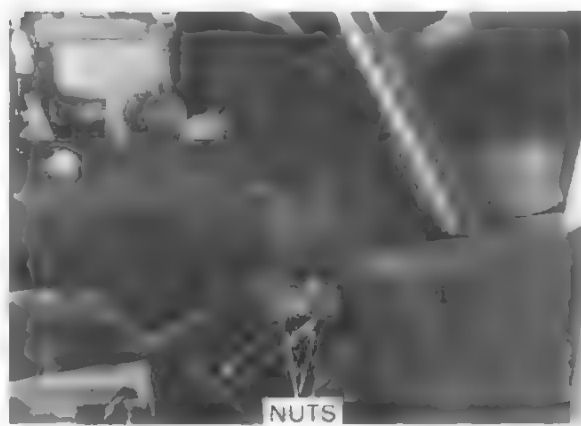


Tighten the exhaust pipe flange nuts securely.



Tighten the muffler band bolt to the specified torque.

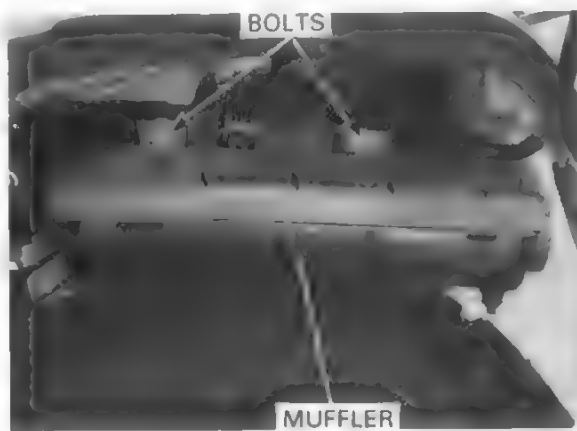
**TORQUE: 23 N·m (2.3 kgf·m , 17 lbf·ft)**



## FRAME/BODY PANELS/EXHAUST SYSTEM

---

Tighten the two bolts/washers securely.



# 3. MAINTENANCE

3

SERVICE INFORMATION	3-1	BRAKE FLUID	3-15
MAINTENANCE SCHEDULE	3-3	BRAKE SHOE WEAR	3-16
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DRIVE SHAFT BOOT	3-13	STEERING SYSTEM	3-22
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## SERVICE INFORMATION

### GENERAL

#### ⚠ WARNING

- Place the vehicle on level ground before starting any work.
- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area.
- The exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death.

### SPECIFICATIONS

ITEM		SPECIFICATIONS	
Throttle lever free play		3 – 8 mm (1/8 – 5/16 in)	
Spark plug	Standard	DPR7EA-9 (NGK)	X22EPR-U9 (DENSO)
	For cold climate (below 5°C/41°F)	DPR6EA-9 (NGK)	X20EPR-U9 (DENSO)
	For extended high speed riding	DPR8EA-9 (NGK)	X24EPR-U9 (DENSO)
Spark plug gap		0.8 – 0.9 mm (0.03 – 0.04 in)	
Valve clearance	IN	0.15 mm (0.006in)	
	EX	0.15 mm (0.006in)	



## MAINTENANCE

ITEM			SPECIFICATIONS
Engine idle speed			1,400 ± 100 rpm
Engine oil capacity	At draining		2.0 ℓ (2.10 US qt, 1.76 Imp qt)
	At disassembly		2.7 ℓ (2.84 US qt, 2.38 Imp qt)
	At oil filter change		2.1 ℓ (2.21 US qt, 1.85 Imp qt)
Recommended engine oil			HONDA GN4 4-stroke oil or equivalent motor oil API service classification SF or SG
Front differential oil capacity at draining			98 – '01: 190cm <sup>3</sup> (6.4 US oz, 6.7 Imp oz)
			After '01: 241cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)
Recommended differential oil			Hypoid gear oil SAE #80
Final drive oil capacity at draining			100cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)
Recommended final drive oil			Hy pooid gear oil SAE #80
Recommended brake fluid			DOT 3 or 4
Front brake lever free play			25 – 30 mm (1 – 1-1/4 in)
Rear (parking) brake lever free play			15 – 20 mm (5/8 – 3/4 in)
Brake pedal free play			15 – 20 mm (5/8 – 3/4 in)
Reverse selector lever free play			2 – 4 mm (1/16 – 1/8 in)
Tire size	Front		AT 25×8-12 ★★
	Rear		AT 25×10-12 ★★
Cold tire pressure	Front	Standard	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6 psi)
		Minimum	22 kpa (0.22 kg/cm <sup>2</sup> , 3.2 psi)
		Maximum	28 kpa (0.28 kg/cm <sup>2</sup> , 4.0 psi)
		With cargo	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6 psi)
	Rear	Standard	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6 psi)
		Minimum	22 kpa (0.22 kg/cm <sup>2</sup> , 3.2 psi)
		Maximum	28 kpa (0.28 kg/cm <sup>2</sup> , 4.0 psi)
		With cargo	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6 psi)
Toe			Toe-out : 35 mm (1-3/8 ± 9/16 in)

## TORQUE VALUES

Oil drain bolt	25 N·m (2.5 kgf·m, 18 lbf·ft)
Valve adjuster lock nut	17 N·m (1.7 kgf·m, 12 lbf·ft)
Spark plug	18 N·m (1.8 kgf·m, 13 lbf·ft)
Timing hole cap	10 N·m (1.0 kgf·m, 7 lbf·ft)
Differential gear case drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Differential gear case cover oil cap	12 N·m (1.2 kgf·m, 9 lbf·ft)
Final gear case drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Final gear case oil cap	12 N·m (1.2 kgf·m, 9 lbf·ft)
Final gear case oil check bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Clutch adjusting screw lock nut	22 N·m (2.2 kgf·m, 16 lbf·ft)
Tie-rod lock nut	54 N·m (5.5 kgf·m, 40 lbf·ft)

# MAINTENANCE SCHEDULE

Perform the Pre-ride inspection in the Owner's Manual at each scheduled maintenance period.

I: Inspect and Clean, Adjust, Lubricate or Replace if necessary. C: Clean. R: Replace. A: Adjust. L: Lubricate.

		FREQUENCY	Which ever comes first	mi	INITIAL MAINTENANCE	REGULAR MAINTENANCE INTERVAL		Refer to page
						600	1200	
			km	150		1000	2000	
	ITEMS		NOTE	HOURS	20	100	200	
EMISSION RELATED ITEM	* FUEL LINE						I	3-4
	* THROTTLE OPERATION						I	3-4
	* CARBURETOR CHOKE						I	3-5
	AIR CLEANER	(NOTE 1)				C	C	3-7
	AIR CLEANER HOUSING DRAIN TUBE	(NOTE 2)				I	I	3-7
	SPARK PLUG					I	I	3-7
	* VALVE CLEARANCE				I	I	I	3-8
	ENGINE OIL				R	R	R	3-10
	ENGINE OIL FILTER				R	R	R	3-12
	* ENGINE IDLE SPEED				I	I	I	3-13
	DRIVE SHAFT BOOTS					I	I	3-13
NON EMISSION RELATED ITEM	REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL					(R:EVERY 2YEARS)	I	3-13
	* BRAKE FLUID	(NOTE 3)				I	I	3-15
	* BRAKE SHOE WEAR	(NOTE 1)					I	3-16
	BRAKE SYSTEM				I	I	I	3-16
	* REVERSE LOCK SYSTEM				I	I	I	3-18
	SKID PLATES, ENGINE GUARD					I	I	3-19
	* CLUTCH SYSTEM				I	I	I	3-19
	* SUSPENSION					I	I	3-20
	* SPARK ARRESTER					C	C	3-20
	* NUTS, BOLTS, FASTENERS				I		I	3-21
	** WHEELS/TIRES				I	I	I	3-21
	** STEERING SHAFT HOLDER BEARING						I	3-21
	** STEERING SYSTEM						I	3-22

\* Should be serviced by an authorized HONDA dealer, unless the owner has proper tools and service data and is mechanically qualified.

\*\* In the interest of safety, we recommended these items be serviced only by an authorized HONDA dealer.

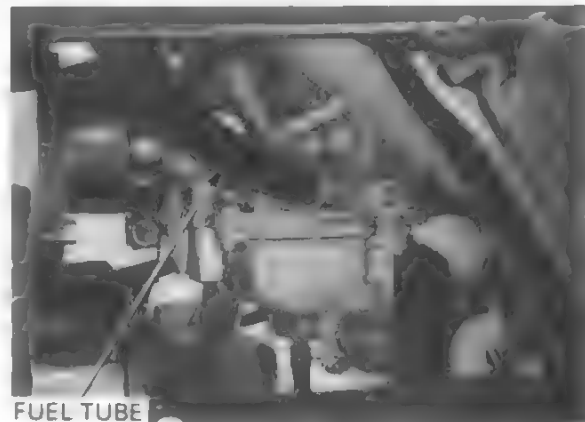
NOTES: 1. Service more frequently when riding in dusty areas, sand or snow.  
2. Service more frequently after riding in very wet or muddy conditions.  
3. Replace every 2 years. Replacement requires mechanical skill.

### FUEL LINE

Remove the side/fuel tank cover assembly (page 2-3).

Check the fuel line.

Replace it if it shows signs of deterioration, damage or leaking.



### THROTTLE OPERATION

Check for smooth throttle lever operation with complete opening and automatic closing in all steering positions.

Make sure there is no deterioration, damage or kinking in the throttle cable.

Replace any damaged parts.

Disconnect the throttle cable at the upper end (page 12-6).

Thoroughly lubricate the cable and pivot point with a commercially available cable lubricant.

Install the throttle cable in the reverse order of removal.

Make sure the throttle lever free play is 3–8 mm (1/8 – 5/16 in) at the tip of the throttle lever.

Minor adjustments can be made at the upper adjuster.

Throttle lever free play can be adjusted at throttle housing adjuster.

Slide the rubber boot off the cable adjuster.

Loosen the lock nut and adjust the throttle cable free play by turning the cable adjuster.

After adjustment, tighten the lock nut and install the rubber boot securely.

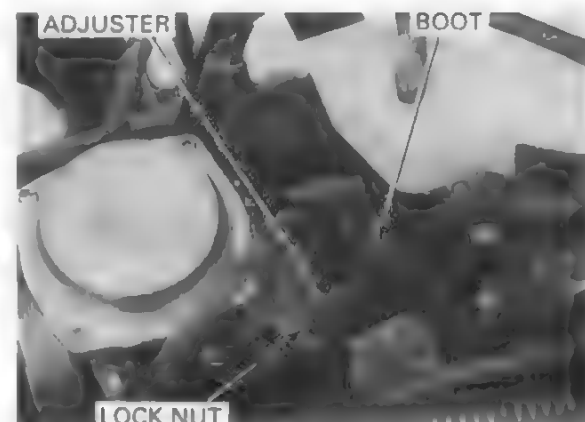
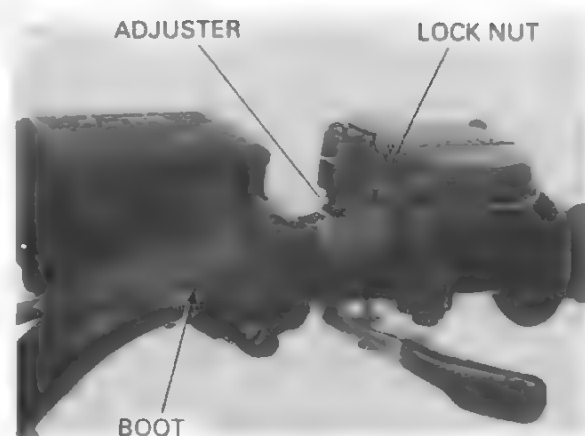
Major adjustments are made with the lower adjuster.

Remove the seat (page 2-3).

Slide the rubber boot off the cable adjuster.

Adjust by loosening the lock nut and turning the adjuster.

After adjustment, tighten the lock nut and install the rubber boot securely. Check throttle operation. Install the seat (page 2-3).



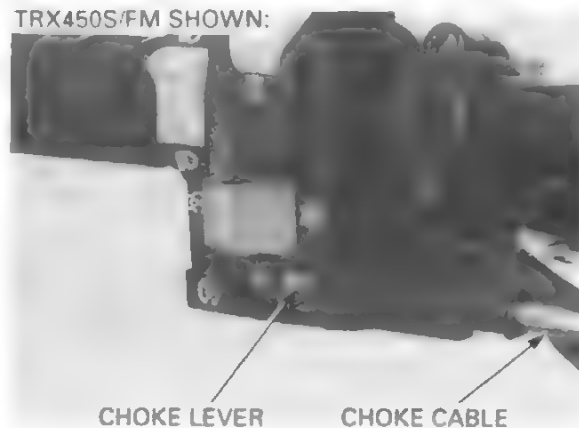
# CARBURETOR CHOKE

**TRX450S/FM:** The choke system uses a fuel enrichment circuit controlled by a starting enrichment (SE) valve. The SE valve opens the enrichment circuit via a cable when the choke lever on the handlebar is moved to the left.

Check for smooth choke lever operation and lubricate the choke cable if required.

Inspect the cable for cracks which could allow moisture to enter.  
Replace the cable if necessary.

TRX450S/FM SHOWN:

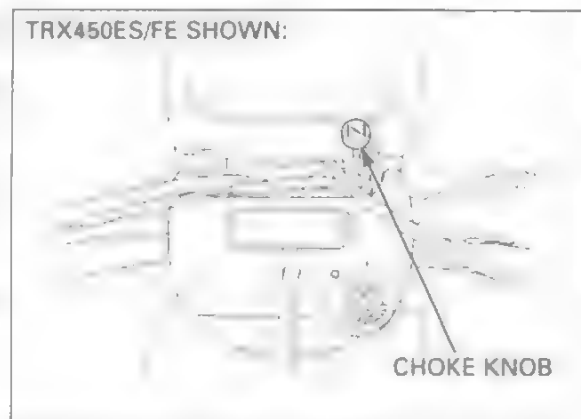


**TRX450ES/FE** The choke system uses a fuel enrichment circuit controlled by a starting enrichment (SE) valve. The SE valve opens the enrichment circuit via a cable when the choke knob on the handle bar cover is pulled up.

Check for smooth choke knob operation and lubricate the choke cable if required.

Inspect the cable for cracks which could allow moisture to enter.  
Replace the cable if necessary.

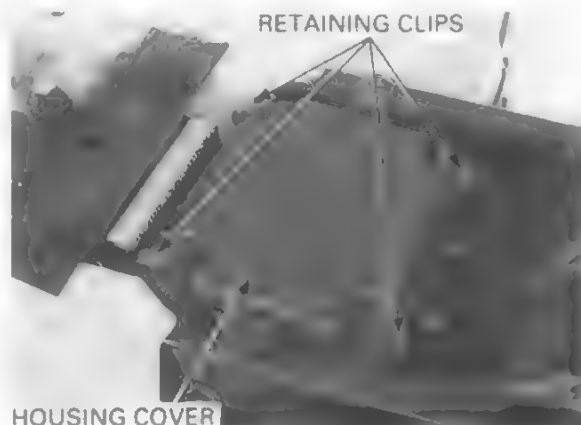
TRX450ES/FE SHOWN:



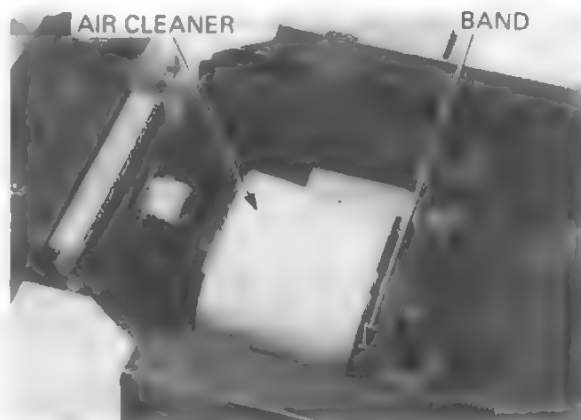
# AIR CLEANER

Remove the seat (page 2-3).

Release the retaining clips from the air cleaner housing cover and remove the cover.



Loosen the air cleaner element band screw. Remove the air cleaner element assembly from the housing.



## MAINTENANCE

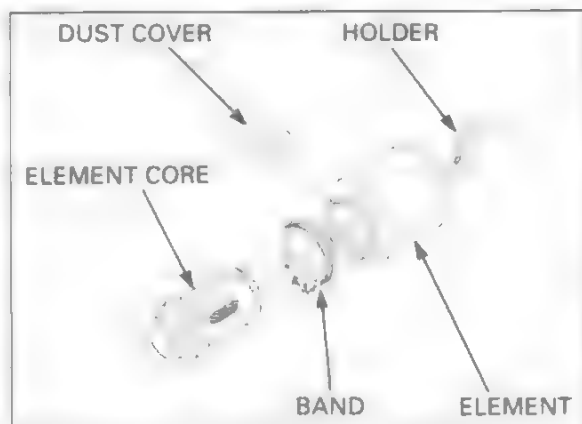
Remove the element holder by turning it counter-clockwise.  
Remove the element band and separate the element from the element core.

### Dust Cover

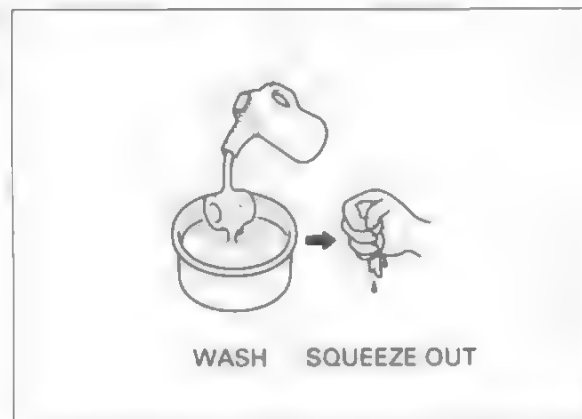
If the dust cover is dirty, clean it by compressed air.

#### NOTE:

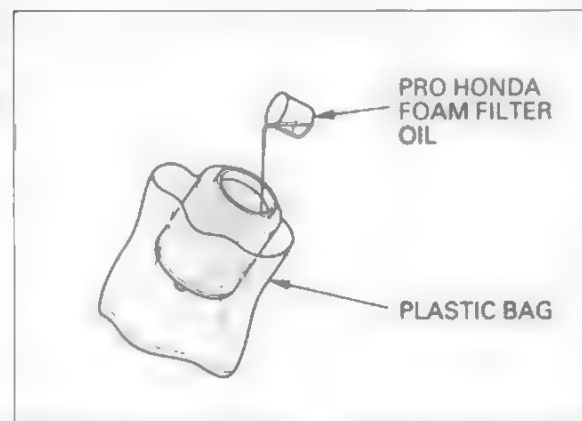
Do not shove the dust cover.



Wash the element in non-flammable or high flash point solvent.  
Squeeze out the solvent thoroughly, and allow the element to dry.



Apply approximately 32-37 cc (1.1-1.3 oz) of Pro Honda Foam Filter Oil or an equivalent oil from the inside of the element.  
Place the element into a plastic bag and spread the oil evenly by hand.



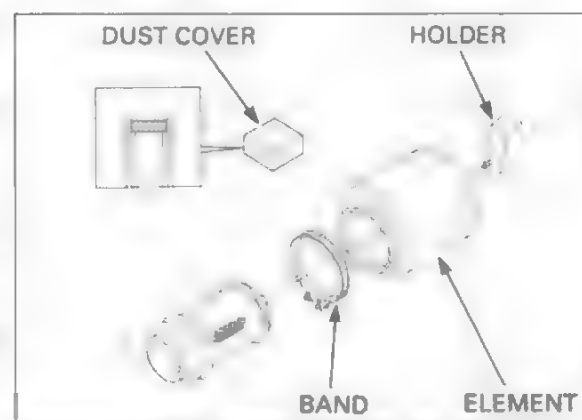
Place the element onto the core and replace the element band and holder.

Install the element in the air cleaner housing, and tighten the band.  
Install the dust cover.

#### NOTE:

Do not shove the dust cover.

Install the air cleaner housing cover and secure with the clips.  
Install the seat (page 2-3).



## AIR CLEANER HOUSING DRAIN TUBE

Remove the drain plug from the air cleaner housing to empty any deposits.

Install the drain plug and clip.

### NOTE:

Service more frequently when riding in wet or muddy areas.



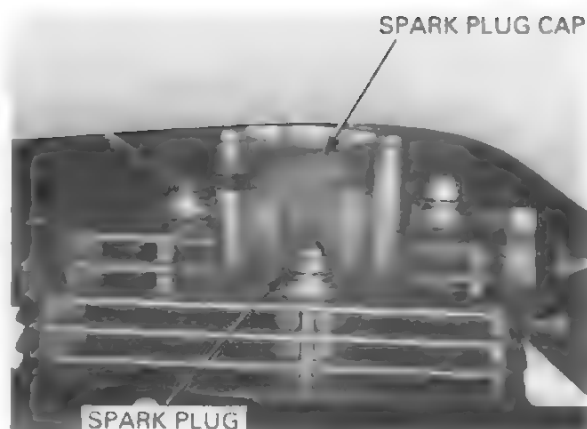
## SPARK PLUG

Disconnect the spark plug cap and remove the spark plug.

### NOTE:

Clean around the spark plug base with compressed air before removing, and be sure that no debris is allowed to enter the combustion chamber.

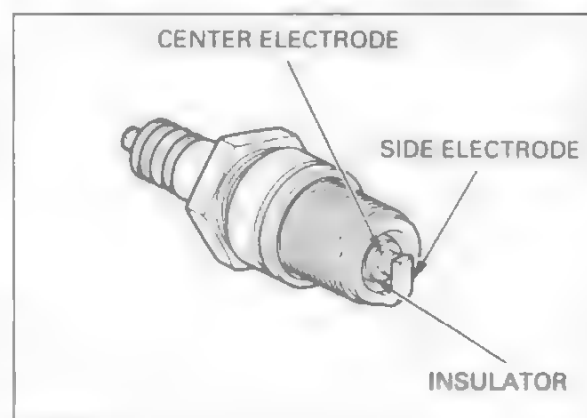
Remove the spark plug and inspect or replace as described in the maintenance schedule.



## INSPECTION

Check the following and replace if necessary (recommended spark plug: page 3-1).

- Insulator for damage
- Electrodes for wear
- Burning condition, coloration;
  - dark to light brown indicates good condition.
  - excessive lightness indicates malfunctioning ignition system or lean mixture.
  - wet or black sooty deposit indicates over-rich mixture.



### REUSING A SPARK PLUG

Clean the spark plug electrodes with a wire brush or special plug cleaner.

Check the gap between the center and side electrodes with a wire-type feeler gauge.

If necessary, adjust the gap by bending the side electrode carefully.

**SPARK PLUG GAP:** 0.8 – 0.9 mm (0.03 – 0.04 in)

#### CAUTION:

*To prevent damage to the cylinder head, hand-tighten the spark plug before using a wrench to tighten to the specified torque.*

Reinstall the spark plug in the cylinder head and hand tighten, then torque to specification.

**TORQUE:** 18 N·m (1.8 kgf·m , 13 lbf·ft)

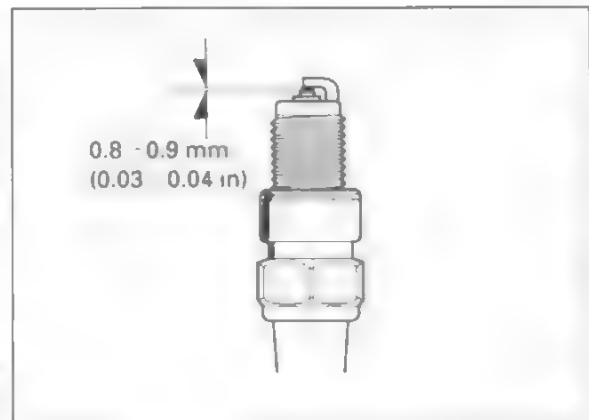
### REPLACING A SPARK PLUG

Set the plug gap to specification with a wire-type feeler gauge (see above).

#### CAUTION:

*Do not overtighten the spark plug.*

Install and hand tighten the new spark plug, then tighten it about 1/2 of a turn after the sealing washer contacts the seat of the plug hole.



## VALVE CLEARANCE

#### NOTE:

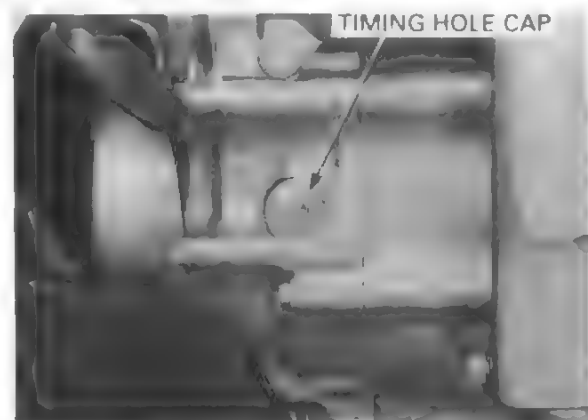
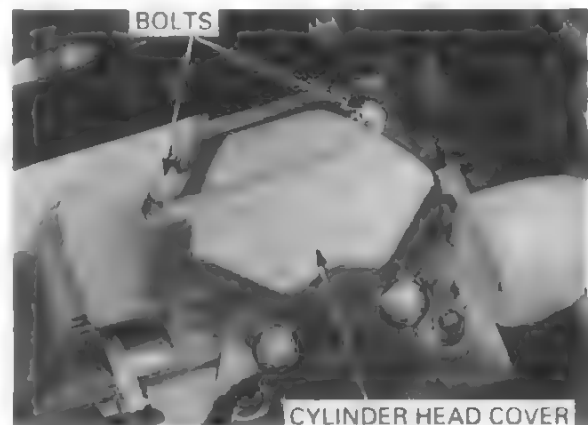
Inspect and adjust the valve clearance while the engine is cold (below 35 °C/95 °F).

Remove the fuel tank and heat guard (page 5-20).

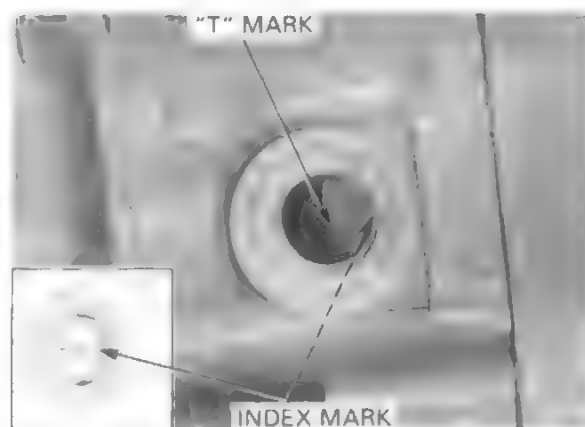
Remove the bolts, cylinder head cover, gasket and O-ring.

Remove the spark plug.

Remove the timing hole cap from the right side of the rear crankcase cover.

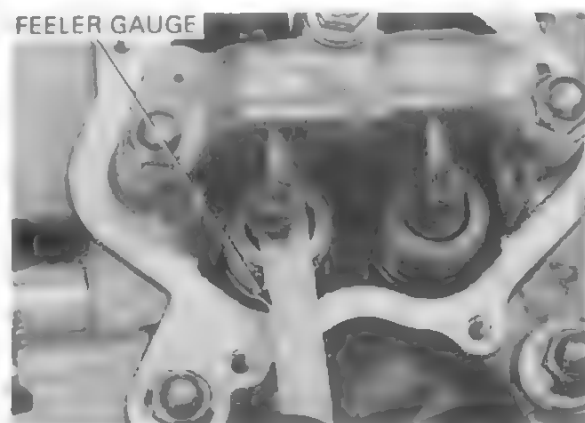


Turn the crankshaft clockwise using the recoil starter knob, and align the "T" mark on the flywheel with the index mark on the rear crankcase cover. Make sure the piston is at TDC on the compression stroke. If not, rotate the crankshaft 360° (1 full turn) and align the "T" mark with the index mark.



Inspect the intake and exhaust valve clearances by inserting a feeler gauge between the adjusting screw and valve stem.

**VALVE CLEARANCE: IN/EX: 0.15 mm (0.006 in)**

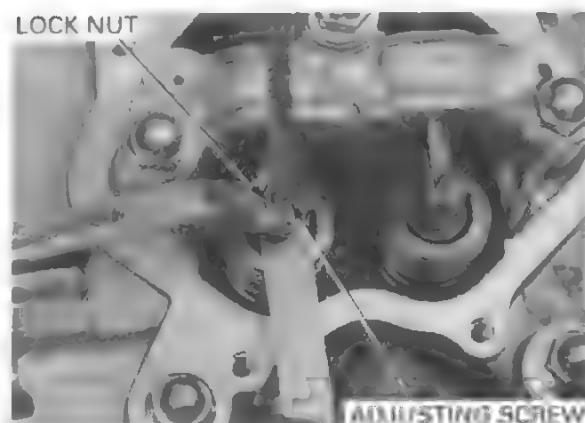


Adjust if necessary by loosening the lock nut and turning the adjusting screw until there is a slight drag on the feeler gauge.

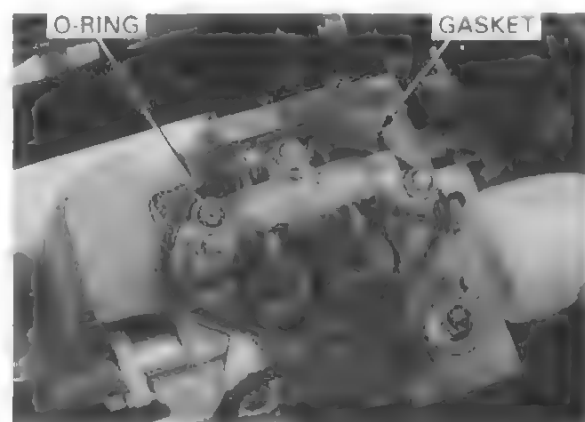
Hold the adjusting screw and tighten the lock nut.

**TORQUE: 17 N·m (1.7 kgf·m , 12 lbf·ft)**

Recheck the valve clearance.



Inspect the condition of the cylinder head cover gasket and O-ring, replace them if necessary. Install the cylinder head cover and tighten the bolts.



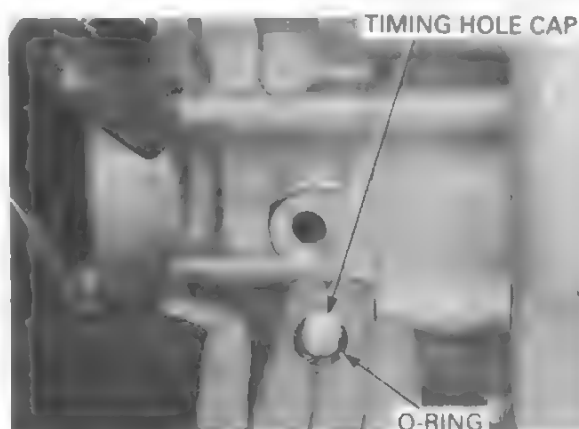


## MAINTENANCE

Check that O-ring is in good condition, and install the timing hole cap.

**TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)**

Install the removed parts in the reverse order of removal.



## ENGINE OIL AND OIL FILTER

### OIL LEVEL INSPECTION

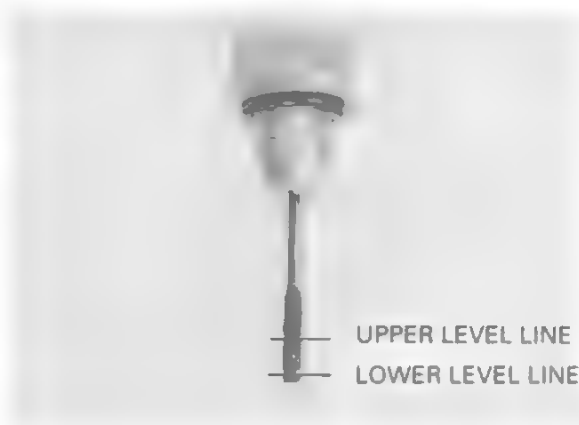
Place the vehicle on level ground.

Remove the oil filler cap/dipstick and wipe it clean. Reinstall the oil filler cap/dipstick, but do not screw it.



Remove the oil filler cap/dipstick and check the oil level.

If the level is below the lower mark on the dipstick, fill the crankcase with recommended oil.



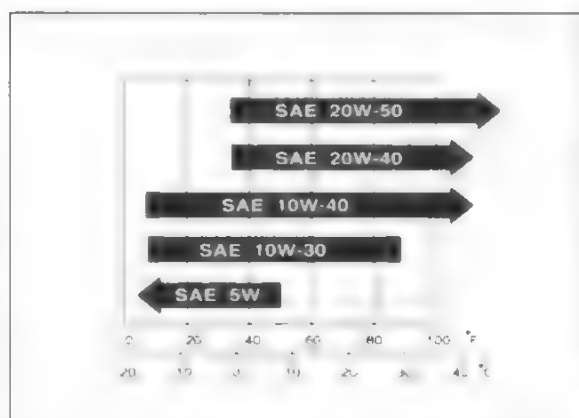
### RECOMMENDED ENGINE OIL:

HONDA GN4 4-stroke oil or equivalent motor oil  
API service classification: SF or SG  
Viscosity: 10W - 40

### NOTE:

Other viscosities shown in the chart may be used when the average temperature in your riding area is within the indicated range.

Reinstall the oil filler cap/dipstick.



## ENGINE OIL AND FILTER CHANGE

### ⚠ WARNING

*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

Warm up the engine.

### NOTE:

Change the engine oil with the engine warm and the vehicle on level ground to assure complete draining.

Stop the engine and remove the oil filler cap/dipstick and drain bolt.  
Drain the oil completely.

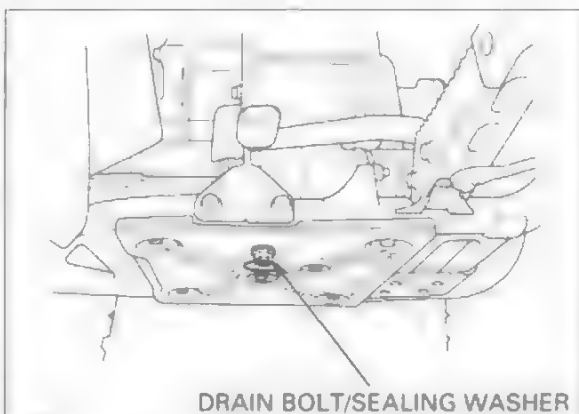
### CAUTION:

*Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.*

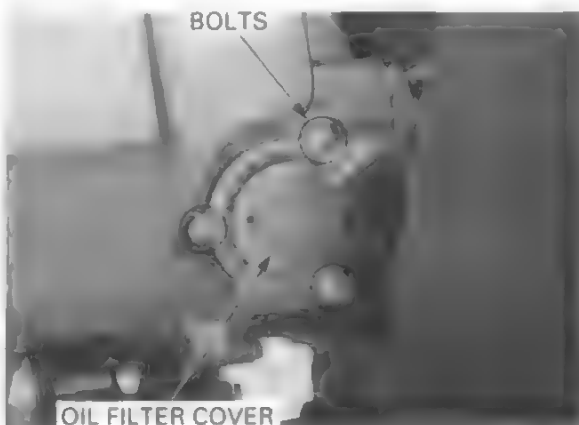
Remove the bolts and oil filter cover.

Remove the oil filter and spring.  
Discard the oil filter.

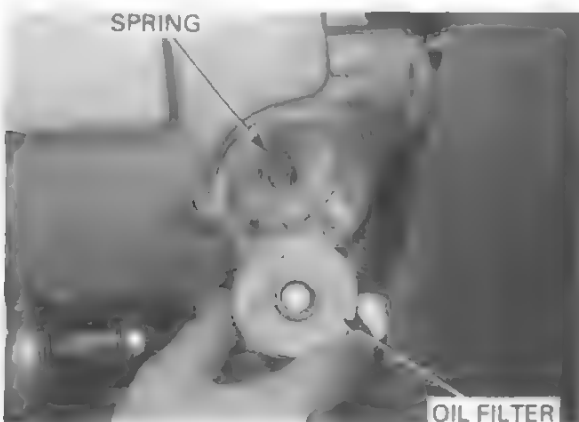
OIL FILLER CAP/DIPSTICK



DRAIN BOLT/SEALING WASHER



BOLTS



SPRING

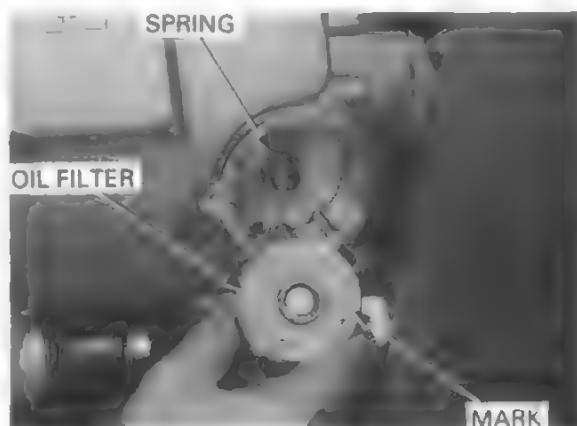
OIL FILTER

## MAINTENANCE

Install the oil filter spring to the rear crankcase cover. Install a new oil filter with its "OUT-SIDE (TOWARDS FILTER COVER)" mark facing out.

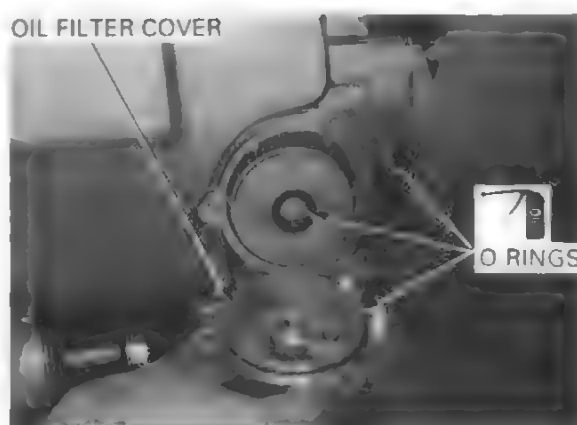
### CAUTION:

*Installing the oil filter backwards will result in severe engine damage.*



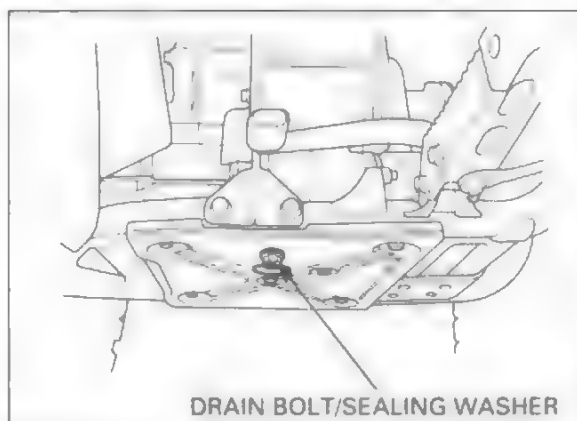
Make sure that the O-rings are in good condition and replace if necessary. Apply oil to the O-rings. Install the oil filter cover and tighten the bolts to the specified torque.

**TORQUE:** 10 N·m (1.0 kgf·m , 7 lbf·ft)



Check that the sealing washer on the drain bolt is in good condition, replace if necessary. Install and tighten the drain bolt.

**TORQUE:** 25 N·m (2.5 kgf·m , 18 lbf·ft)



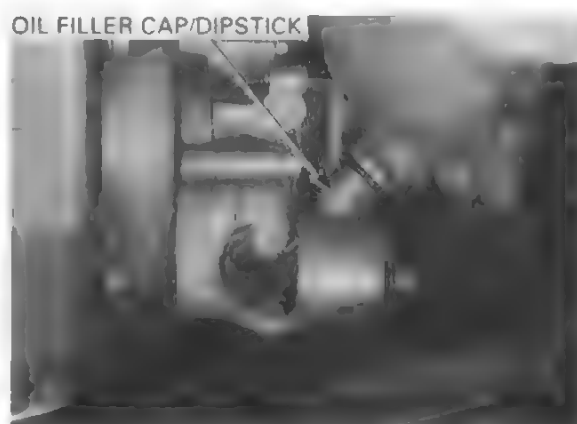
Fill the crankcase with the recommended engine oil.

### OIL CAPACITY:

2.0 liter (2.10 US qt, 1.76 Imp qt) after draining  
2.1 liter (2.21 US qt, 1.85 Imp qt) at oil filter change

Install the oil filler cap/dipstick. Start the engine and let it idle for 2 to 3 minutes.

Stop the engine and check that the oil level is at the upper level line on the dipstick. Make sure there are no oil leaks.



## ENGINE IDLE SPEED

### ⚠ WARNING

*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

### NOTE:

- Inspect and adjust the idle speed after all other engine maintenance items have been performed and are within specifications.
- The engine must be warm for accurate idle speed inspection and adjustment.

Warm up the engine for about ten minutes.  
Remove the right lower side cover (page 2-3).

Turn the throttle stop screw as required to obtain the specified idle speed.

**IDLE SPEED: 1,400 ± 100 rpm**



THROTTLE STOP SCREW

## DRIVE SHAFT BOOTS

### INSPECTION

Check the drive shaft boots for cuts or other damage.

If the drive shaft boots are damaged, replace them.  
See page 15-3 for boot replacement.



DRIVE SHAFT BOOTS

## REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL

### OIL LEVEL CHECK

#### Rear Final Gear Case

Remove the oil check bolt and check that the oil flows out of the check bolt hole.



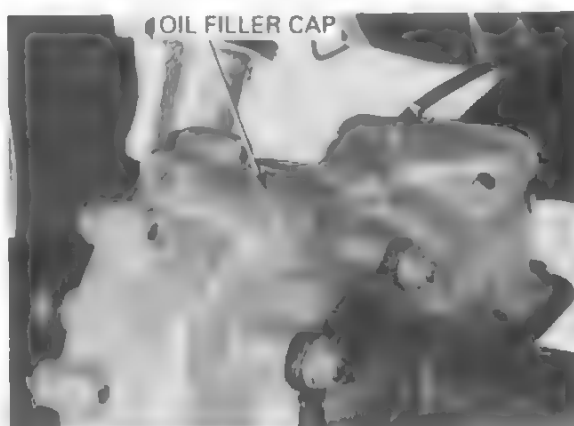
CHECK BOLT

## MAINTENANCE

If there is no oil flow, remove the oil filler cap and add oil slowly through the oil filler hole until the oil starts to flow out of the oil check bolt hole.

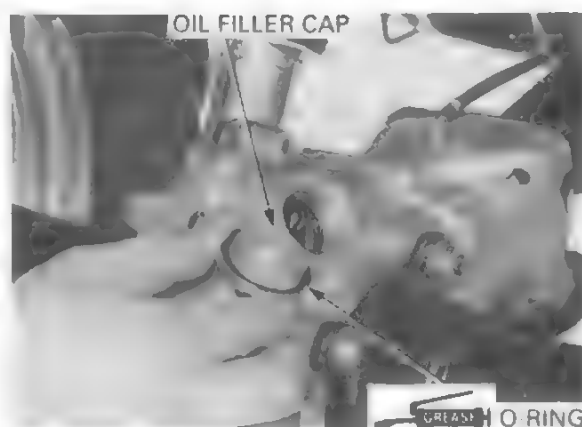
**RECOMMENDED OIL:** Hypoid gear oil SAE #80

Check for leak if the oil level was low.



Coat a new O-ring with grease and install it onto the oil filler cap.  
Install and tighten the oil filler cap.

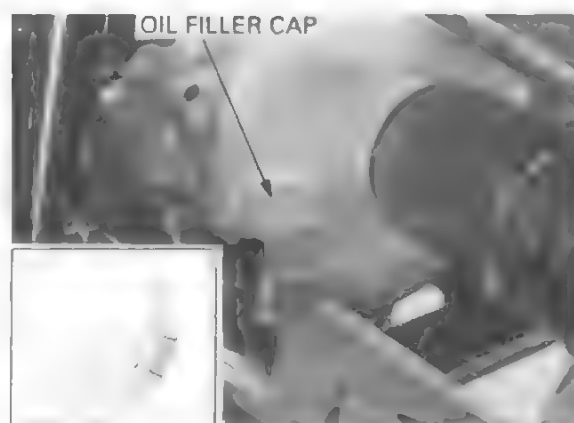
**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)



### Front Differential

Remove the oil filler cap.

Check that the oil level is up to lower edge of the oil filler hole.



Check for leaks, if the oil level is low.

Pour recommended oil through the oil filler hole until it reaches the lower edge of the hole.

**RECOMMENDED OIL:** Hypoid gear oil SAE #80

Coat a new O-ring with grease and install it onto the oil filler cap.

Install and tighten the oil filler cap.

**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)



## OIL CHANGE

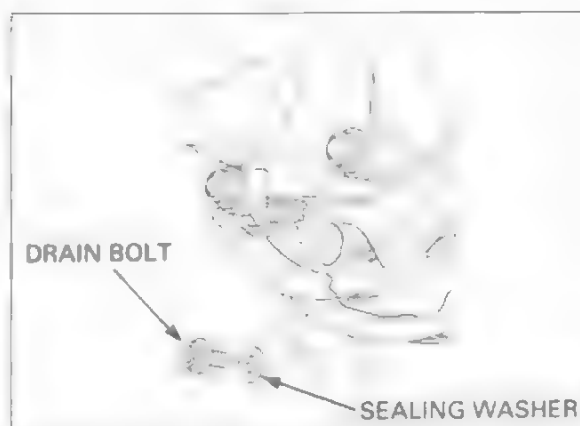
### Rear Final Gear Case

Remove the oil filler cap and the drain bolt to drain all oil from the gear case.

Check that the drain bolt sealing washer is in good condition, replace if necessary.

Tighten the drain bolt to the specified torque.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

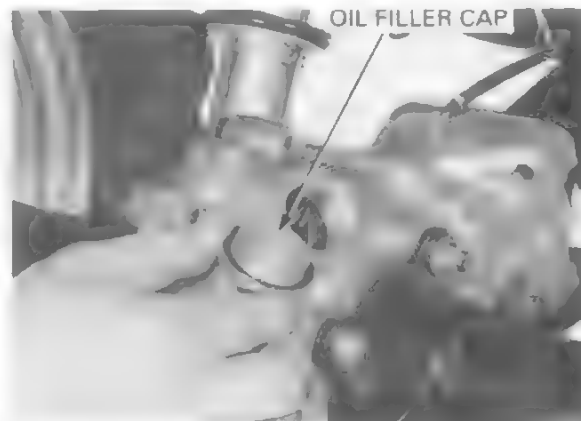


Fill the final gear case with the recommended oil.

### OIL CAPACITY:

90 cm<sup>3</sup> (3.0 US oz, 3.2 Imp oz) after draining

Check the oil level (page 3-13).



### Front Differential

Remove the oil filler cap and the drain bolt to drain all oil from the differential case.

Check that the drain bolt sealing washer is in good condition, replace if necessary.

Tighten the drain bolt to the specified torque.

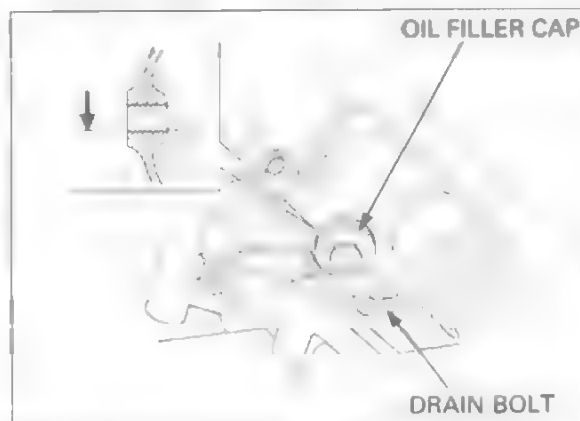
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Fill the differential case with the recommended oil.

### OIL CAPACITY (after draining):

'98 - '01: 190 cm<sup>3</sup> (6.4 US oz, 6.7 Imp oz)

After '01: 241 cm<sup>3</sup> (8.2 US oz, 8.5 Imp oz)



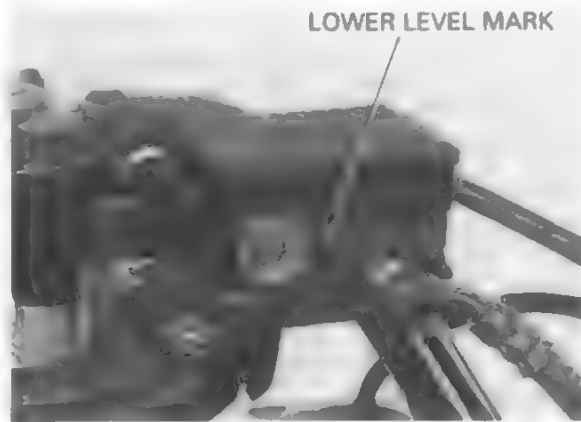
## BRAKE FLUID

### CAUTION:

- Do not mix different types of fluid, as they are not compatible with each other.
- Do not allow foreign material to enter the system when filling the reservoir.
- Avoid spilling fluid on painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.

Check the brake reservoir level through the sight glass.

If the level is near the lower level mark, check the brake shoe wear (page 3-16).



### BRAKE SHOE WEAR

#### FRONT BRAKE

Remove the brake shoe lining inspection hole cap and inspect the lining thickness.

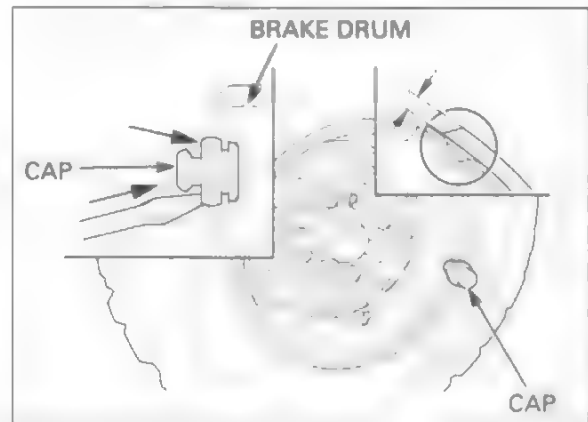
##### LINING THICKNESS:

**STANDARD:** 4.0 mm (0.16 in)

**SERVICE LIMIT:** 2.0 mm (0.08 in)

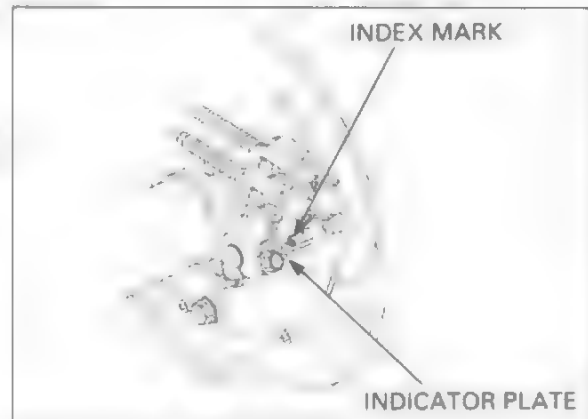
##### NOTE:

If either lining on one wheel is worn beyond the limit, both brake shoes for that wheel must be replaced.



#### REAR BRAKE

Replace the brake shoes if the indicator plate aligns with the brake panel index mark when the rear brake lever or pedal is applied.



### BRAKE SYSTEM

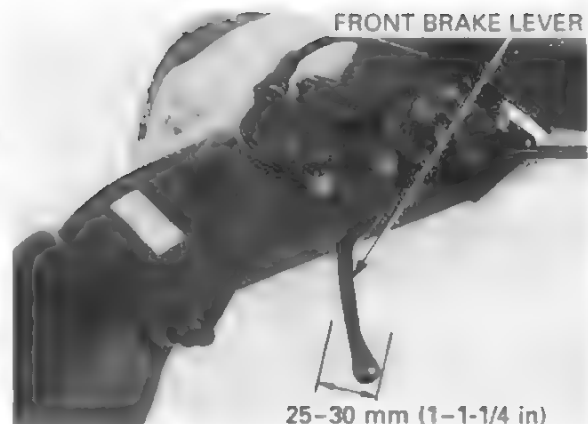
#### FRONT BRAKE

Measure the distance the brake lever moves before the brake starts to take hold.

Free play, measured at the tip of the front brake lever, should be within standard.

**FREE PLAY:** 25 – 30 mm (1 – 1-1/4 in)

If the brake lever free play is excessive and the brake linings are not worn beyond the recommended limit, adjust the brake shoe lining-to-drum clearance.



Raise the front wheels off the ground by placing a support block under the vehicle.

Remove the inspection hole cap and line up the hole with one of the brake adjusters and turn the brake shoe adjusters up with a screwdriver until the shoes lock, then back off three steps.

Spin the wheel manually to make sure the brake does not drag.

Line up the inspection hole with the second adjusters and repeat the procedure.

Adjust both wheels.

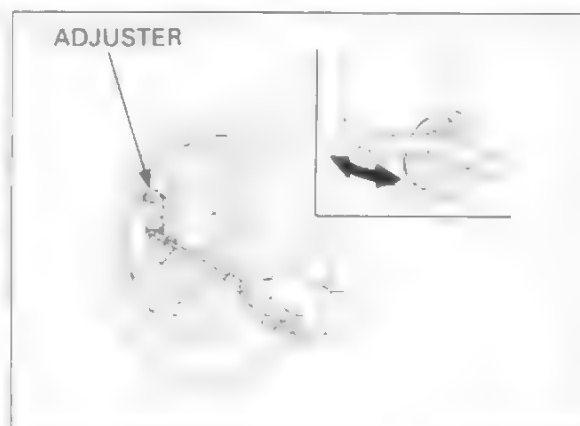
#### NOTE:

- There are two adjusters each front wheel.
- Adjust all four adjusters.

Recheck the brake lever free play.

If free play is still excessive after adjusting the brake lining clearance, there is probably air in the brake system and it must be bled out (section 14).

After checking, install the inspection hole cap securely in the drum while pushing the cap with a screwdriver.



## REAR BRAKE

Check the cable, brake lever and brake pedal for loose connections, excessive play or other damage. Replace or repair if necessary.

Disconnect the brake cables at the brake lever or pedal ends.

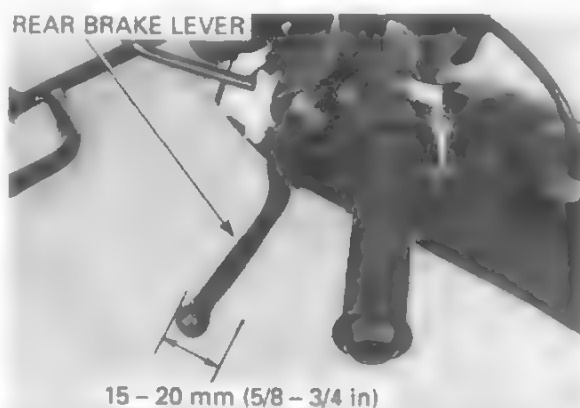
Thoroughly lubricate the cables and their pivot points with a commercially available cable lubricant.

Install the cables.

Measure the rear (parking) brake lever free play at the end of the brake lever.

**FREE PLAY:** 15 – 20 mm (5/8 – 3/4 in)

Adjustments should be made with the lower adjusting nut at the rear brake arm.

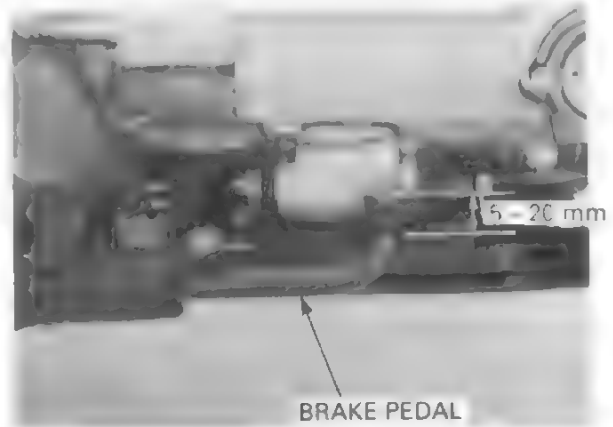




## MAINTENANCE

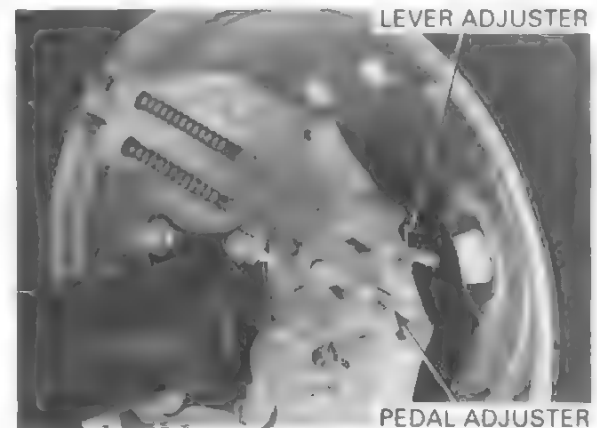
Measure the brake pedal free play at the end of the brake pedal and adjust as required.

**BRAKE PEDAL FREE PLAY:**  
15 – 20 mm (5/8 – 3/4 in)



*Make sure the cut-out of each adjusting nut is seated on the brake arm pin.*

Adjust the rear brake lever and pedal free play by turning the adjusting nuts at the lower end of the cables.



## REVERSE LOCK SYSTEM

Check the reverse selector cable and lever for a loose connection, excessive play or other damage. Replace or repair if necessary.

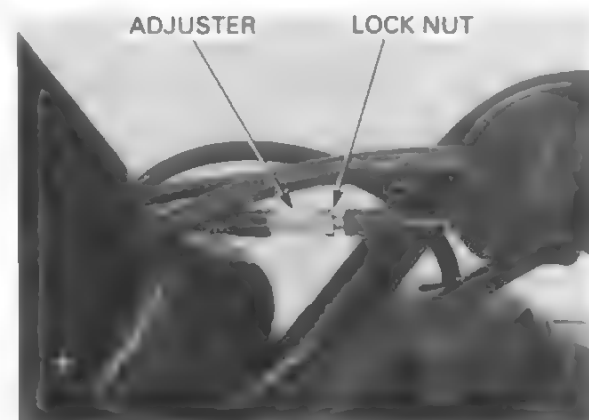
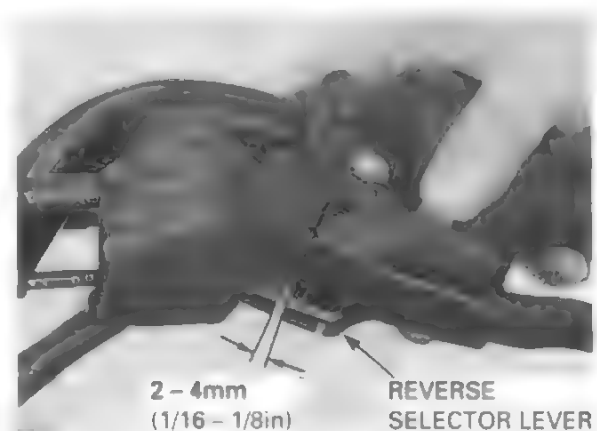
Measure the reverse selector lever free play at the lever end near the cable.

**FREE PLAY: 2 – 4 mm (1/16 – 1/8 in)**

### NOTE:

If necessary, watch the reverse lever on the crankcase to see when it moves while determining free play.

Adjust by loosening the lock nut and turning the adjusting nut. Tighten the lock nut securely.



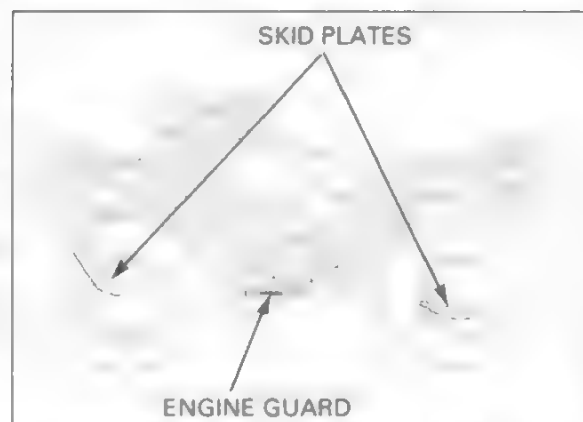
## SKID PLATES/ENGINE GUARD

The skid plates and engine guard protect the rear final gear case and engine from rocks.

Check the skid plates and engine guard for cracks, damage or looseness at intervals shown in the Maintenance Schedule (page 3-3).

Replace the skid plates and engine guard if they are cracked or damaged.

If the plates and engine guard bolts are loose, tighten them.

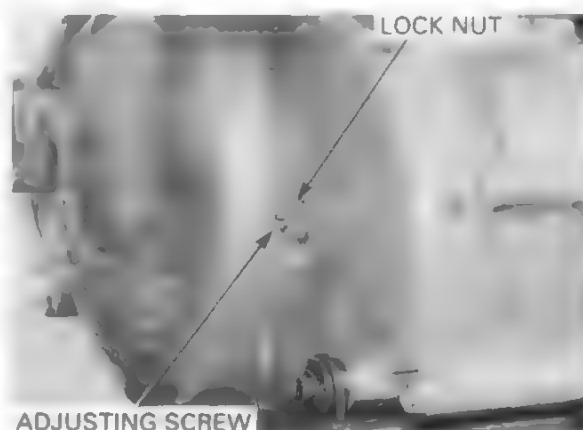


## CLUTCH SYSTEM

### ⚠ WARNING

*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

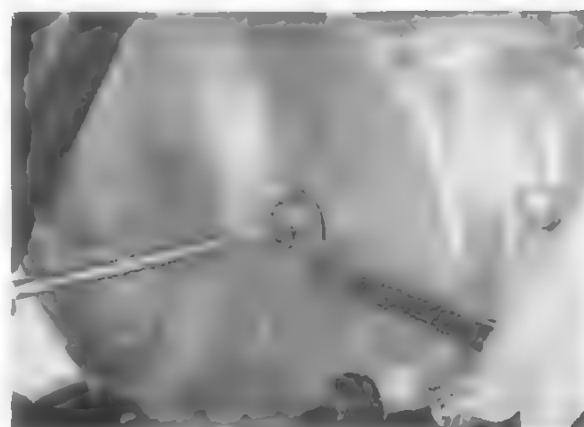
Loosen the clutch adjusting screw lock nut.



Slowly turn the adjusting screw counterclockwise until resistance is felt. Then turn the adjusting screw clockwise 1/4 turn, and tighten the lock nut to the specified torque.

**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**

After adjustment, start the engine and check for proper clutch operation.



### SUSPENSION

#### **⚠ WARNING**

- *Do not ride a vehicle with faulty suspension.*
- *Loose, worn or damaged suspension parts impair vehicle stability and control.*

Check the action of the front/rear shock absorber by compressing them several times.

Check the entire shock absorber assembly for leaks or damage.

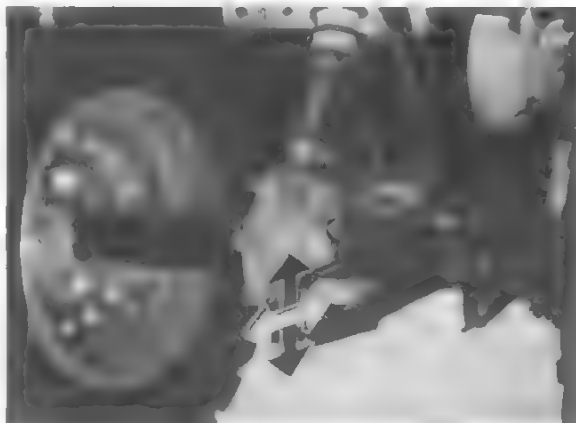
Replace damaged components which cannot be repaired.

Tighten all nuts and bolts.

#### **SWINGARM BEARINGS**

Raise the rear wheels off the ground by placing a jack or block under the engine.

Move the rear axle sideways using moderate force to see if the wheel and swingarm bearings are worn. Replace the bearings if there is any play (page 13-6).



### SPARK ARRESTER

#### **CLEANING**

#### **⚠ WARNING**

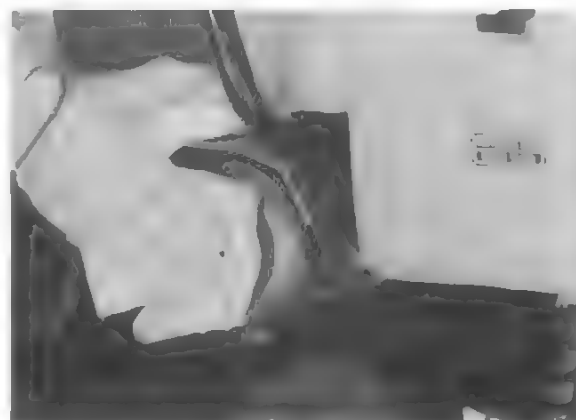
- *If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*
- *Do not touch exhaust components while the exhaust system is hot.*
- *Perform this operation in a well-ventilated area, free from fire hazards.*
- *Use adequate eye protection.*

Remove the bolt.

Block the end of the muffler with a shop towel. Start the engine with the transmission in neutral, and purge accumulated carbon from the muffler by momentarily revving the engine several times.

Stop the engine and allow the exhaust system to cool.

Install the bolt and tighten it securely.



## NUTS, BOLTS, FASTENERS

Tighten bolts, nuts and fasteners at the regular intervals shown in the Maintenance Schedule (page 3-3).

Check that all chassis nuts and bolts are tightened to their correct torque values (page 1-13 through 15).

## WHEELS/TIRES

*Tire pressure should be checked when the tires are COLD.*

Check the tires for cuts, embedded nails, or other damage.

Check the tire pressure. Adjust accordingly.

**Tire pressure:**

	FRONT/REAR
Standard	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6psi)
Minimum	22 kpa (0.22 kg/cm <sup>2</sup> , 3.2psi)
Maximum	28 kpa (0.28 kg/cm <sup>2</sup> , 4.0psi)
With cargo	25 kpa (0.25 kg/cm <sup>2</sup> , 3.6psi)

Raise the wheel off the ground and check the hub or knuckle and axle bearings for excessive play or abnormal noise.

Replace any faulty parts (section 12 and 13).

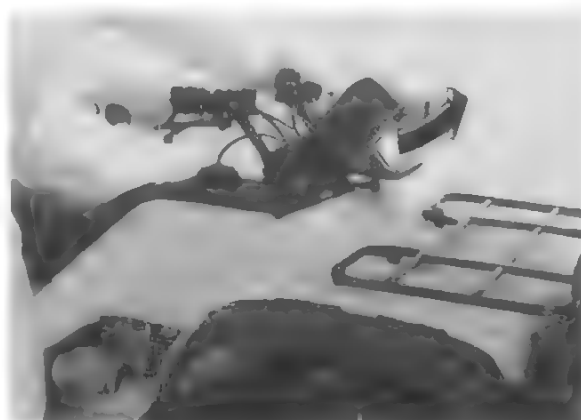


## STEERING SHAFT HOLDER BEARING

*Make sure the cables do not interfere with the rotation of the handlebar.*

Raise the front wheels off the ground and make sure that the handlebar rotates freely.

If the handlebar moves unevenly, binds or has horizontal movement, check the steering shaft holder bushing and steering bearing, and replace them if necessary (page 12-23).



### STEERING SYSTEM

#### TOE

*Toe is measured with no load on the vehicle.*

Place the vehicle on level ground with the front wheels facing straight ahead.

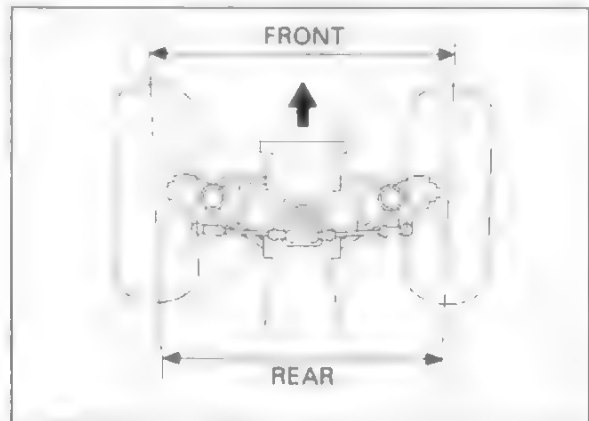
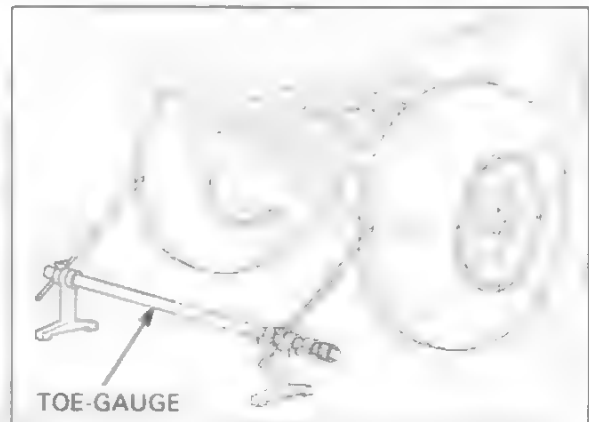
Mark the centers of the tires with chalk to indicate the axle center height.

Align the gauge with the marks on the tires as shown.

Check the readings on the gauge scales.

Slowly move the vehicle back until the wheels have turned 180° so the marks on the tires are aligned with the gauge height on the rear side.

Measure the toe on the rear part of the tires at the same points.



*Toe-out means the front measurement is greater than the rear measurement.*

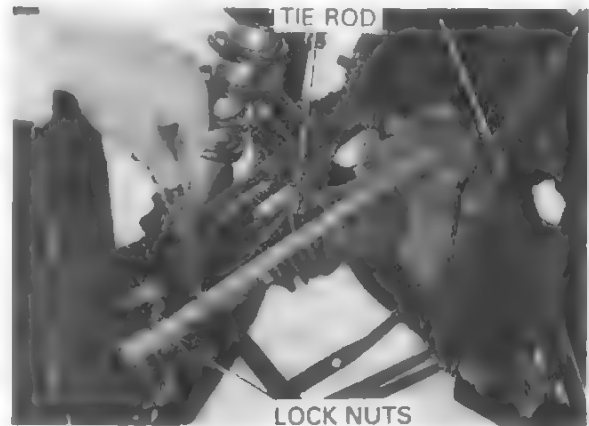
**TOE-OUT:  $35 \pm 15$  mm ( $1\text{-}3/8 \pm 9/16$  in)**

When the toe is out of specification, adjust it by changing the length of the tie-rods equally by loosening the lock nuts and turning the tie-rods while holding the ball joints.

After adjusting each tie-rod, rotate both the ball joints in the same direction with the tie-rod axis until they stop against the ball joint stud. Hold them in that position and tighten the tie-rod lock nuts.

**TORQUE: 54 N·m (5.5 kgf·m , 40 lbf·ft)**

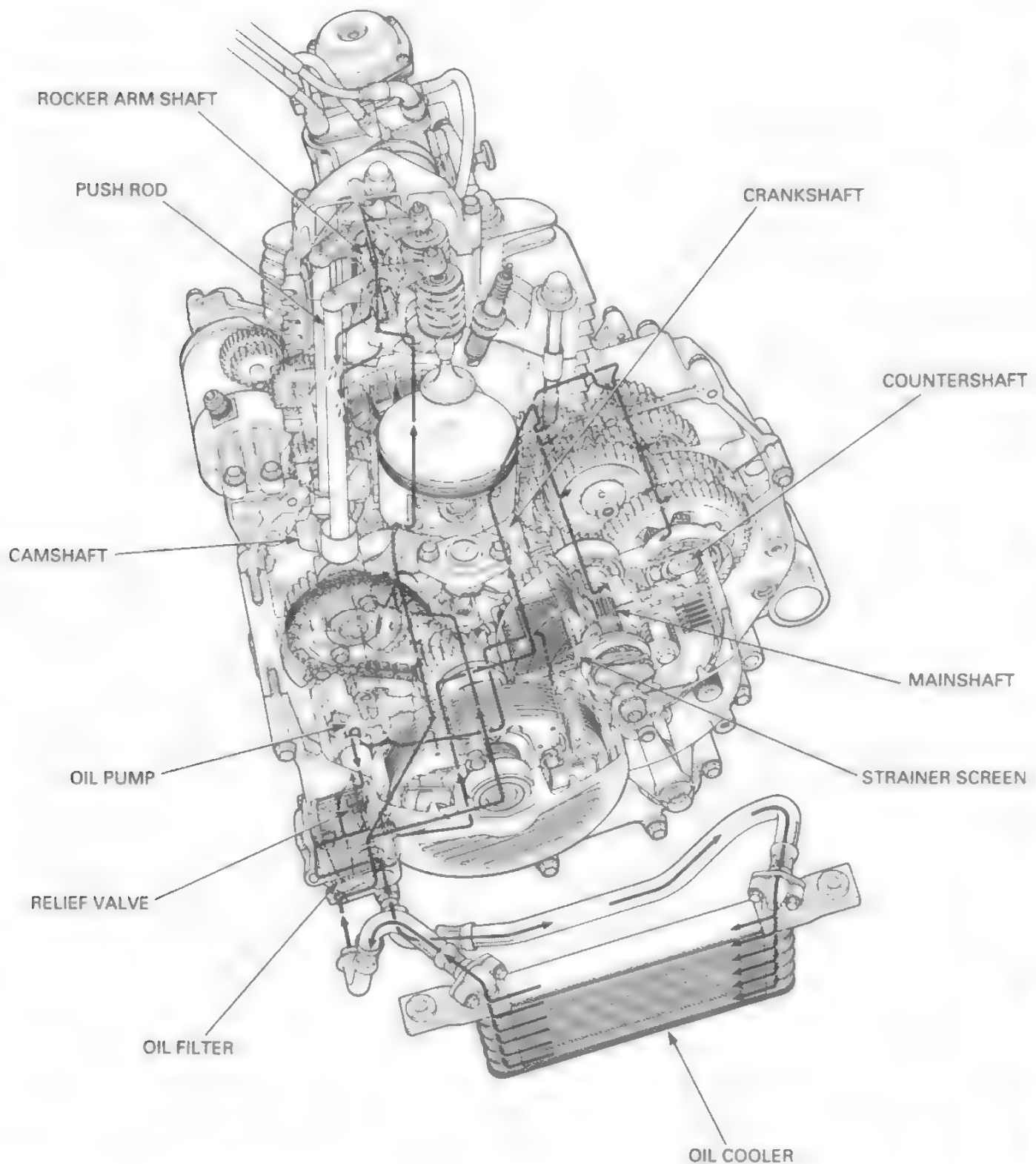
After finally tightening the lock nuts, make sure the ball joints operate properly by rotating the tie-rods, to make sure both ball joints have equal play.



---

MEMO

## LUBRICATION SYSTEM DIAGRAM



# 4. LUBRICATION SYSTEM

LUBRICATION SYSTEM DIAGRAM	4-0	OIL PUMP	4-8
SERVICE INFORMATION	4-1	RELIEF VALVE	4-11
TROUBLESHOOTING	4-1	OIL STRAINER SCREEN	4-12
OIL COOLER	4-2		

## SERVICE INFORMATION

### GENERAL

#### ⚠ WARNING

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.
- Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil. KEEP OUT OF REACH OF CHILDREN.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Engine oil capacity	At draining	2.0 ℓ (2.10 US qt, 1.76 Imp qt)	_____
	At disassembly	2.7 ℓ (2.84 US qt, 2.38 Imp qt)	_____
	At oil filter change	2.1 ℓ (2.21 US qt, 1.85 Imp qt)	_____
Recommended engine oil		Honda GN4 4-stroke oil or equivalent motor oil API service classification SF or SG Viscosity: SAE 10W-40	_____
Oil pump rotor	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.15 – 0.21 (0.006 – 0.008)	0.25 (0.010)
	Side clearance	0.02 – 0.09 (0.001 – 0.004)	0.11 (0.004)

### TORQUE VALUES

Oil drain bolt	25 N•m (2.5 kgf•m, 18 lbf•ft)
Oil filter cover flange bolt	10 N•m (1.0 kgf•m, 7 lbf•ft)
Oil pump rotor side plate screw	4 N•m (0.40 kgf•m, 2.9 lbf•ft)
Relief valve cap	19 N•m (1.9 kgf•m, 14 lbf•ft)
Cooling fan shroud special bolt	18 N•m (1.8 kgf•m, 13 lbf•ft)

### TROUBLESHOOTING

#### Engine oil level too low-high oil consumption

- External oil leaks
- Worn piston rings
- Oil not changed often enough
- Faulty head gasket

#### Engine oil contamination

- Oil not changed often enough
- Head gasket faulty
- Worn piston rings



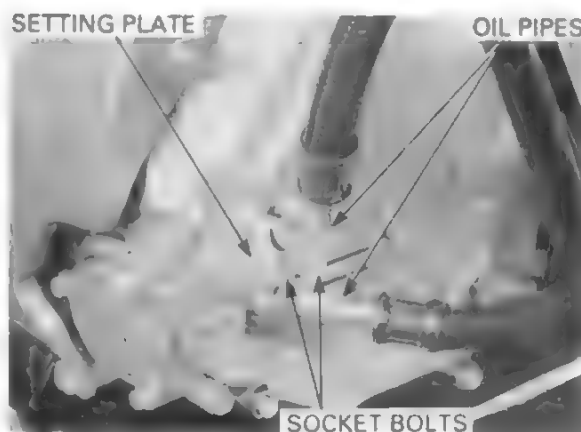
### OIL COOLER

#### REMOVAL

Drain the engine oil (page 3-9).  
Remove the front fender (page 2-5).

Remove the socket bolts and oil pipe setting plate.

Disconnect the oil pipes and remove the O-rings from the front crankcase cover.



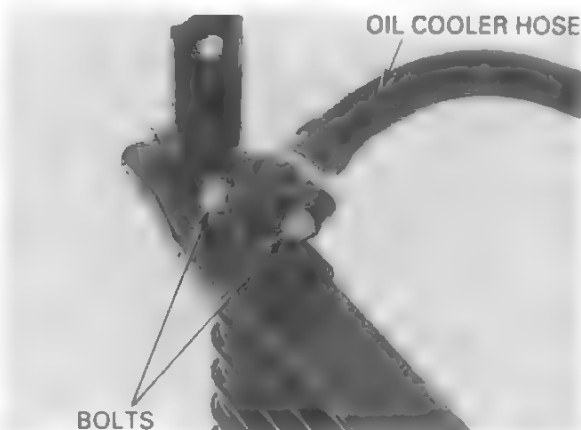
Release the oil cooler hose clamps.

Remove the oil cooler bracket mounting bolts and oil cooler assembly.



#### DISASSEMBLY

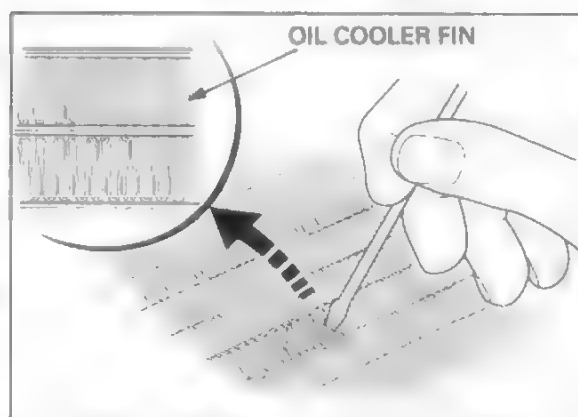
Remove the bolts, oil cooler hoses and O-rings from the oil cooler.



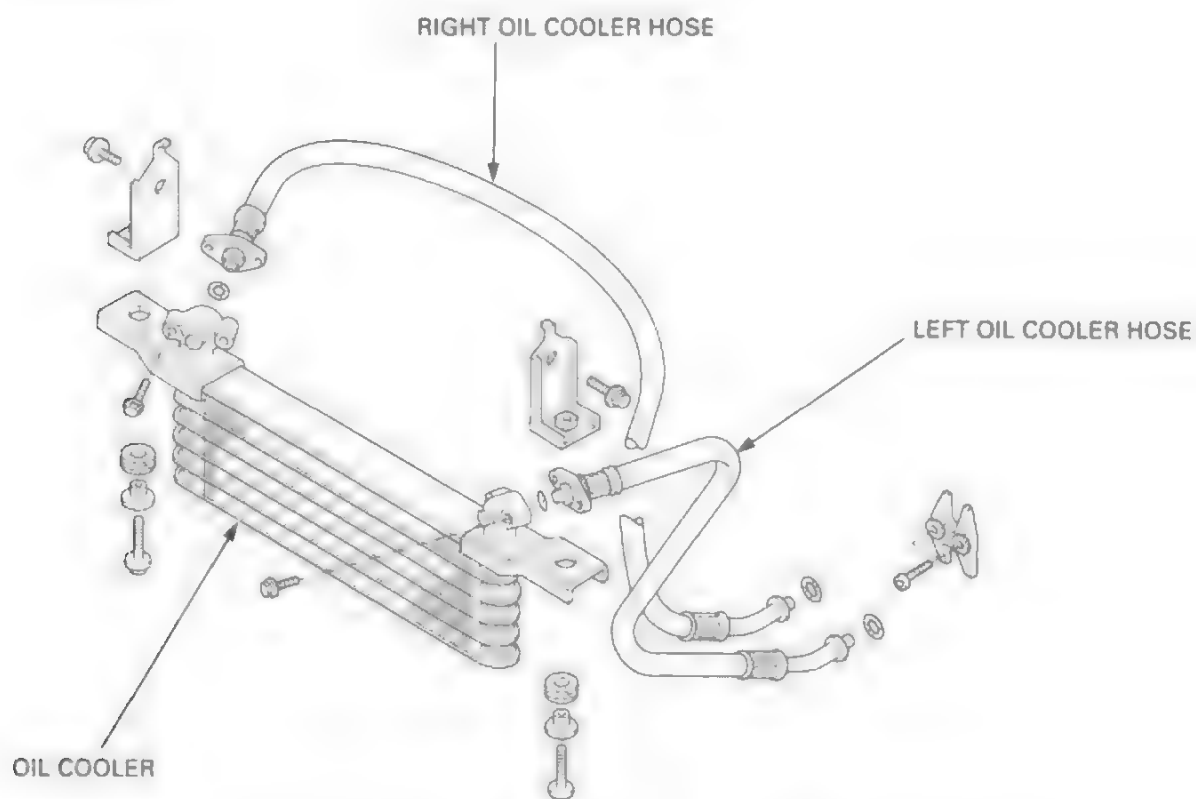
#### INSPECTION

Check the oil cooler air passage for clogging or damage.  
Straighten bent fins with a small, flat blade screwdriver and remove insects, mud or other obstructions with compressed air or low pressure water.

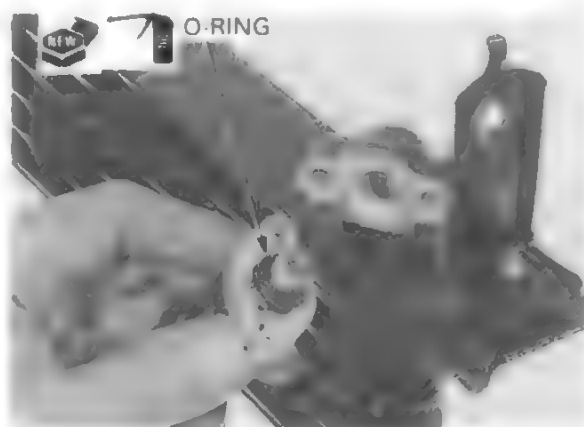
Check for any oil leakage from the oil cooler and hose.



## ASSEMBLY



Apply clean engine oil to the new O-rings.  
Install the O-rings onto the oil cooler hose flange.  
Install the oil hoses and tighten the bolts securely.



## OIL COOLER INSTALLATION

Install the oil cooler into the frame.  
Install and tighten the oil cooler bracket mounting bolts.

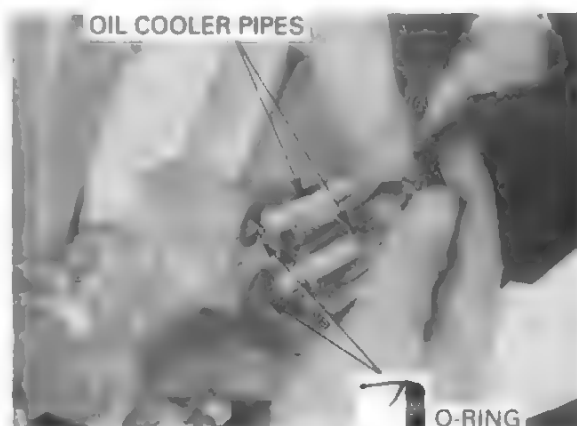
Route the oil cooler pipe properly and secure them with hose clamps.



## LUBRICATION SYSTEM

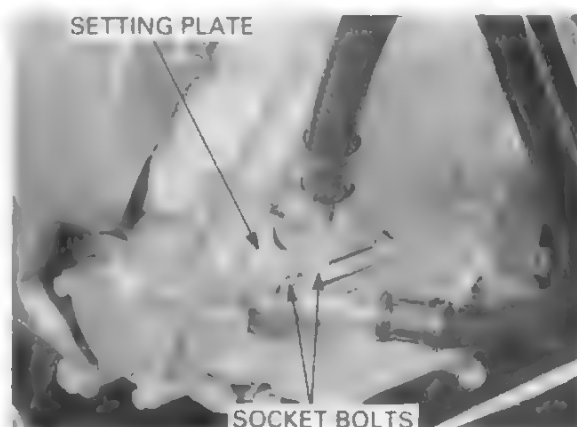
Apply clean engine oil to the new O-rings.  
Install the O-rings onto the oil cooler pipe flanges.

Install the oil pipes into the front crankcase cover.



Install the oil cooler pipe setting plate and tighten the socket bolts securely.

Fill the recommended engine oil (page 3-10).

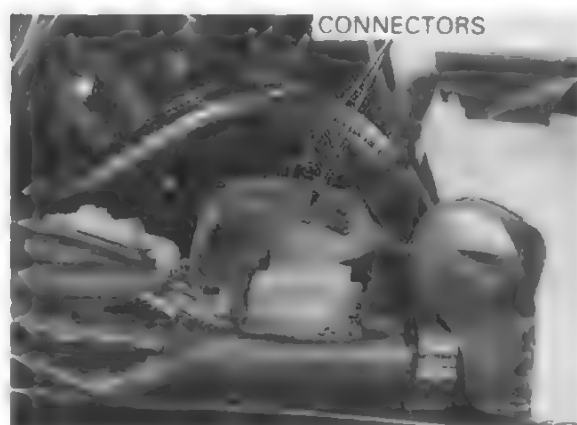


### COOLING FAN MOTOR/SHROUD REMOVAL

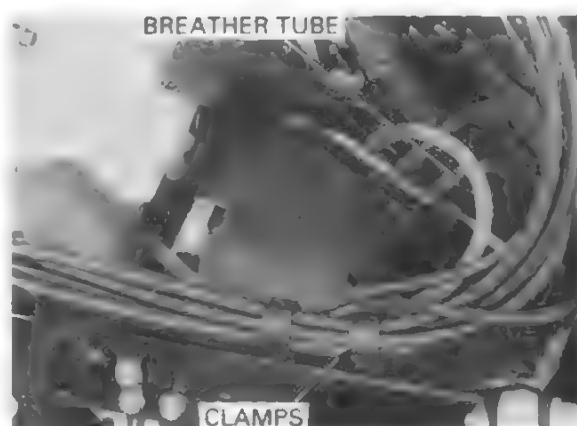
Remove the oil cooler (page 4-2).  
Remove the fuel tank (page 5-20).

Release the cooling fan motor harness clamps.

Disconnect the cooling fan motor connectors.



Release the breather tube clamp and disconnect the cooling fan breather tube.

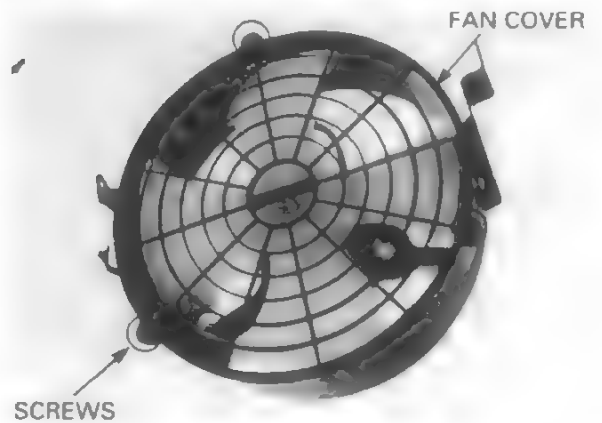


Remove the bracket bolts and cooling fan motor/shroud assembly from the left.

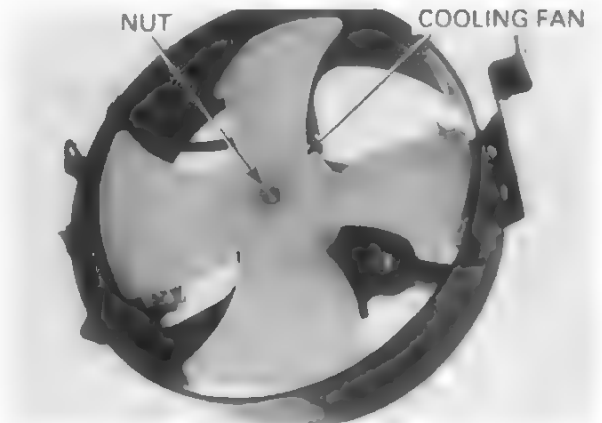


## COOLING FAN MOTOR/SHROUD DISASSEMBLY

Remove the screws and cooling fan cover.

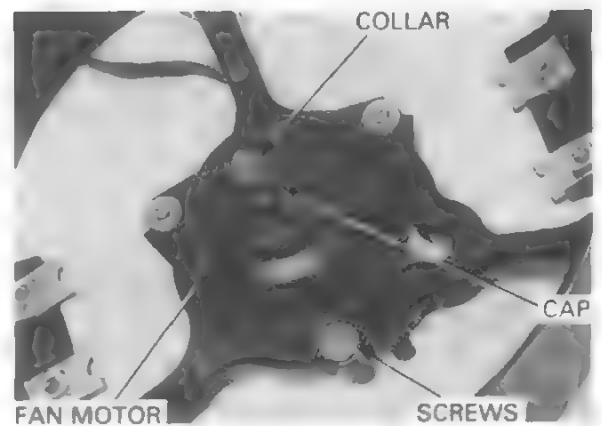


Remove the cooling fan nut and cooling fan.

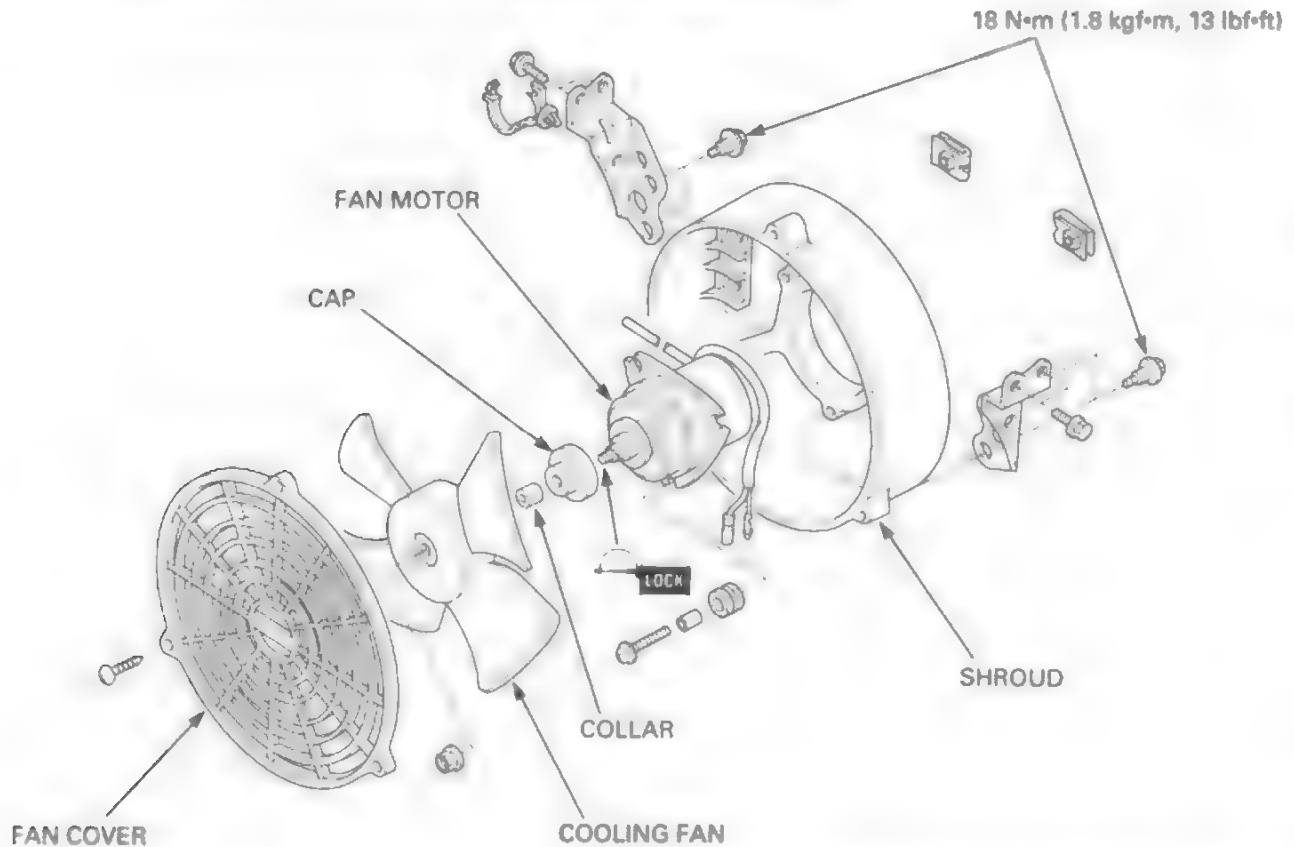


Remove the collar and cap.

Remove the screws, fan motor, collars and grommets.



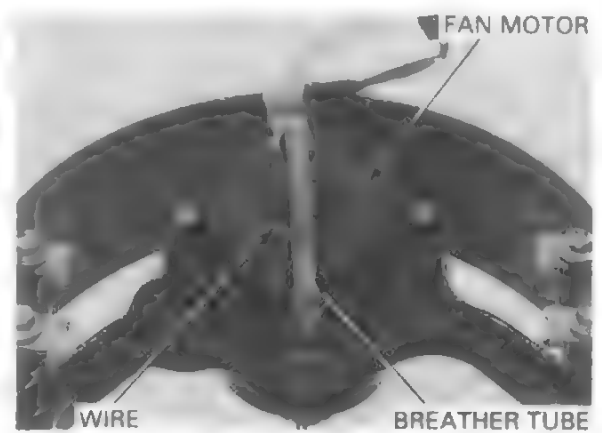
COOLING FAN MOTOR/SHROUD ASSEMBLY



Install the cooling fan motor.

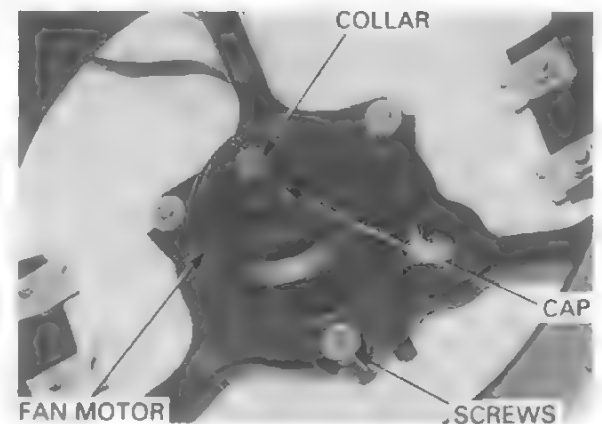
**NOTE:**

Install the fan motor with the fan motor wire and breather tube clamp facing up.

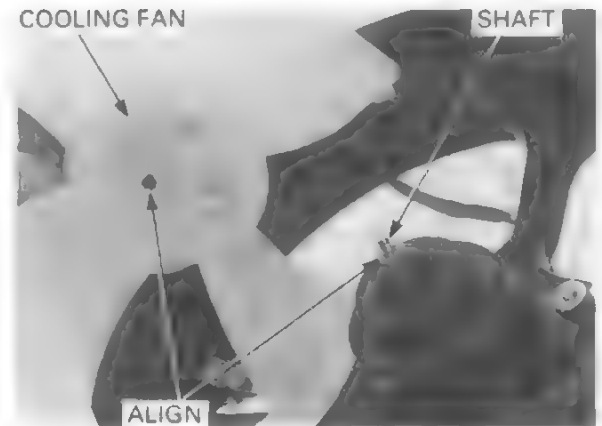


Install and tighten the fan motor screws.

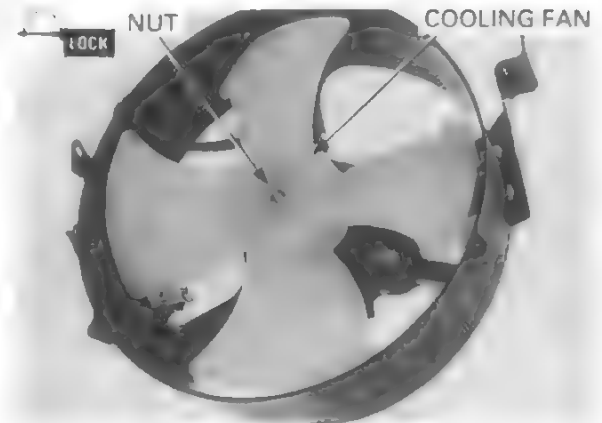
Install the cap and collar onto the fan motor shaft.



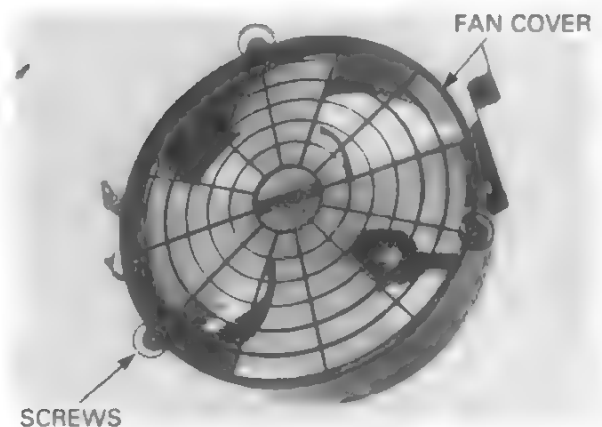
Align the fan motor groove with the fan motor shaft, then install the cooling fan.



Apply a locking agent to the cooling fan motor nut threads. Install and tighten the cooling fan nut.



Install cooling fan cover and tighten the screws.



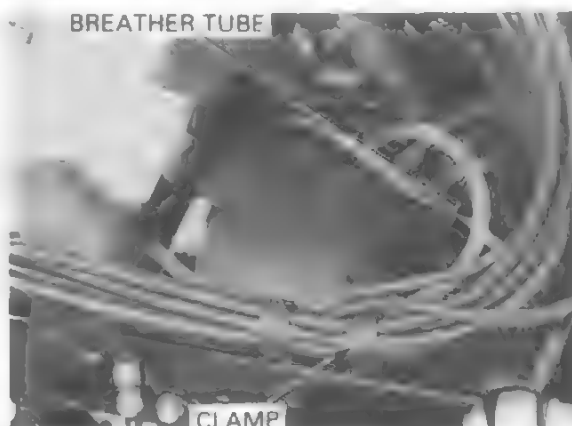
## COOLING FAN MOTOR/SHROUD INSTALLATION

Install the cooling fan motor/shroud assembly into the frame.  
Install and tighten the mounting bolts.



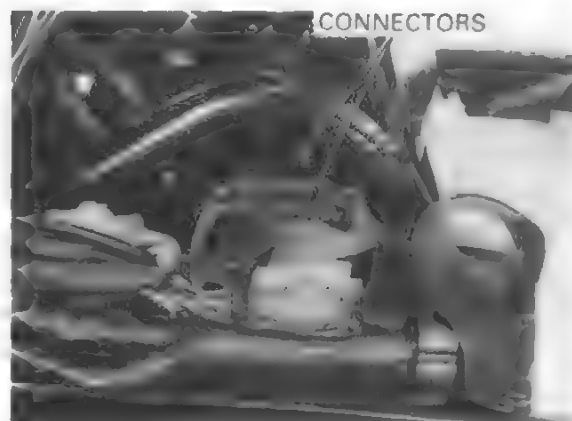
## LUBRICATION SYSTEM

Route and install the breather tube properly and secure it with the clamp.



Connect the cooling fan motor connectors and secure the wire with the clamps.

Install the removed parts in the reverse order of removal.

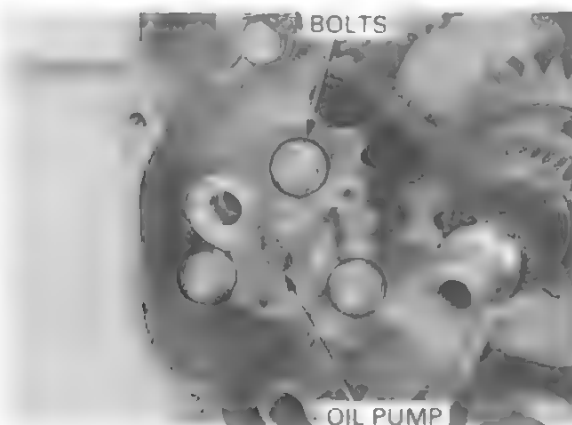


## OIL PUMP

### REMOVAL/DISASSEMBLY

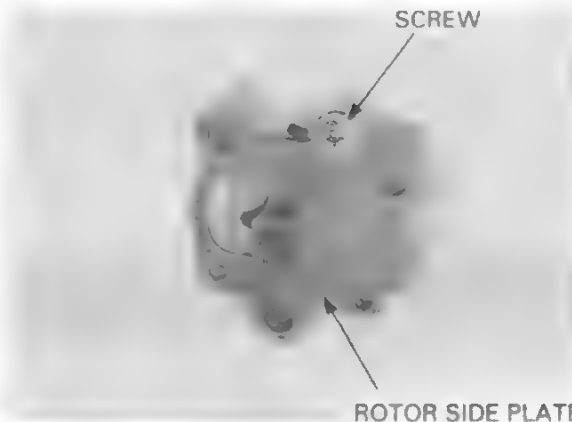
Remove the front crankcase cover (page 8-3).  
Remove the centrifugal clutch (page 8-4).

Remove the dowel pin and O-ring if it is still in the oil pump.  
Remove the three bolts and oil pump assembly.

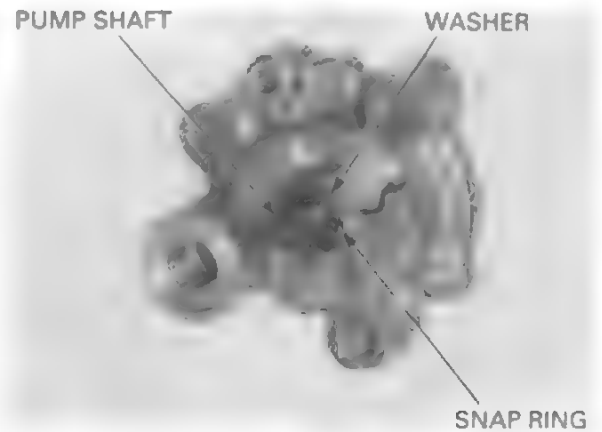


### INSPECTION

Remove the screw and rotor side plate.



Remove the snap ring, washer and oil pump shaft. Mark the rotors which side is up, so they can be reinstalled the same way. Disassemble the oil pump.



Thoroughly clean all the components. Install the outer and inner rotors into the pump body and temporarily insert the oil pump shaft.

Measure the pump body clearance.

**SERVICE LIMIT: 0.25 mm (0.010 in)**



Measure the tip clearance.

**SERVICE LIMIT: 0.20 mm (0.008 in)**



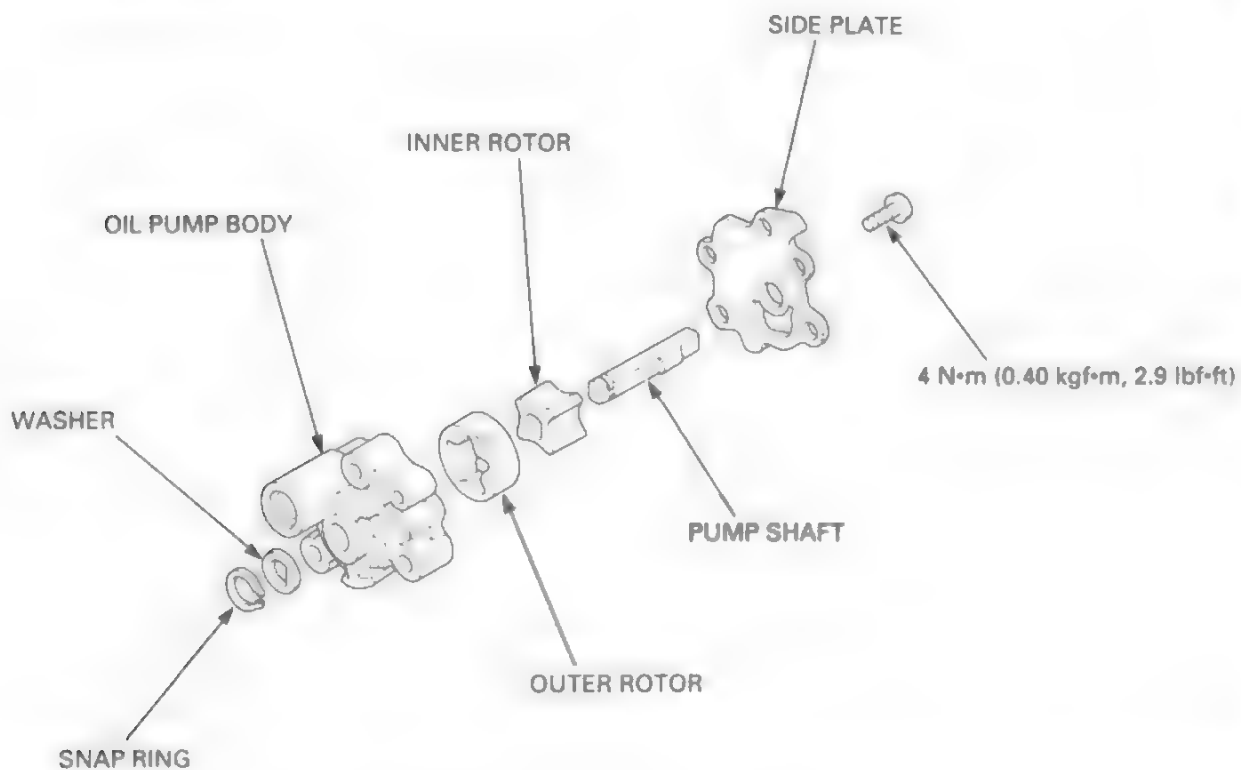
Remove the oil pump drive shaft from the oil pump body and measure the side clearance.

**SERVICE LIMIT: 0.11 mm (0.004 in)**





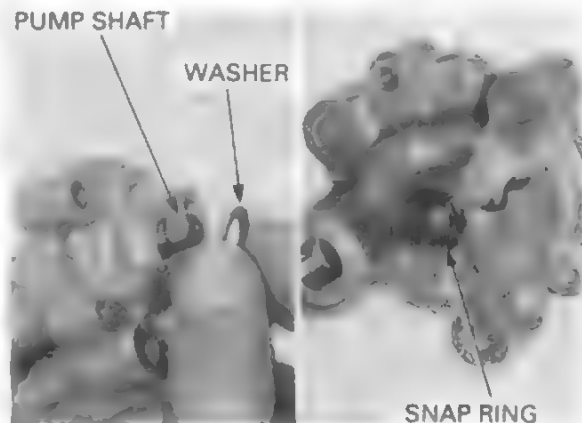
## ASSEMBLY



Install the outer and inner rotor with the same sides up as when they were removed.  
Install the oil pump shaft.  
Install the washer and snap ring.

### NOTE:

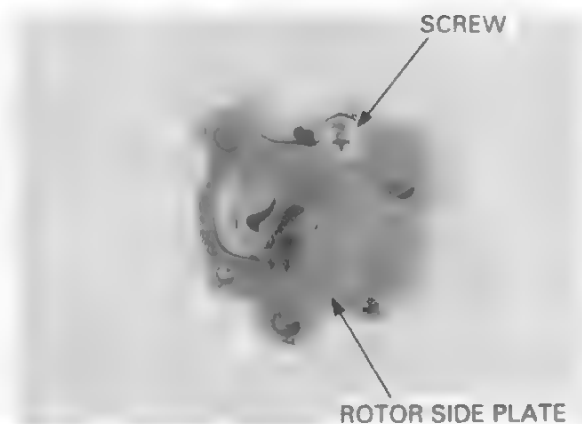
- Align the cut-outs between the pump shaft and washer.
- Install the snap ring with its chamfered side facing the washer.



Install the rotor side plate and tighten the screw to the specified torque.

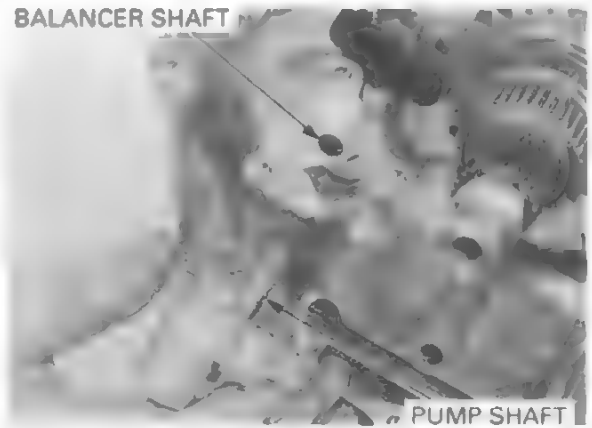
**TORQUE: 4 N·m (0.40 kgf·m, 2.9 lbf·ft)**

Check for smooth operation of the oil pump by turning the oil pump shaft.  
Add a small amount of oil to the pump before installing.



## INSTALLATION

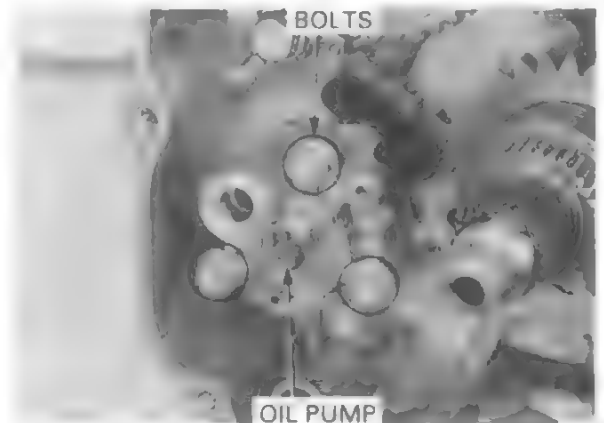
Verify the cam chain slipper is installed.  
Install the oil pump assembly aligning the pump drive shaft boss with the groove in the balancer shaft.  
Also align the side plate tab with the cam chain slipper groove.



Install and tighten the oil pump mounting bolts.

Recheck the oil pump by turning the pump shaft right and left.

Install the centrifugal clutch (page 8-10).  
Install the front crankcase cover (page 8-18).



## RELIEF VALVE

### DISASSEMBLY

Remove the front crankcase cover (page 8-3).

Remove the relief valve cap, spring and valve.



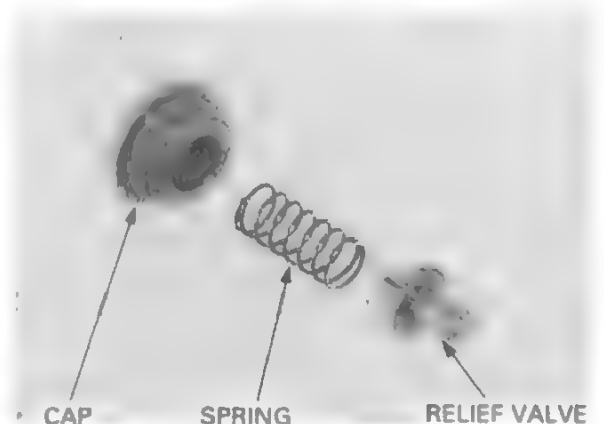
### INSPECTION

Inspect the relief valve and spring for wear or damage.  
Replace the relief valve and spring if necessary.

### ASSEMBLY

Install the relief valve with the long projection side facing in.  
Install the spring.

Apply a locking agent to the thread of the relief valve cap.

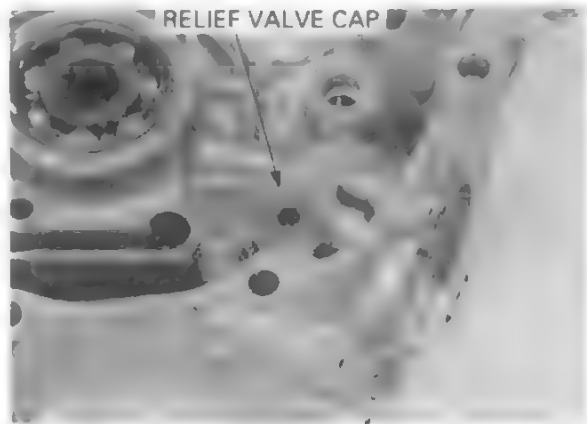


## LUBRICATION SYSTEM

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Install and tighten the relief valve cap to the specified torque.

**TORQUE: 19 N·m (1.9 kgf·m, 14 lbf·ft)**



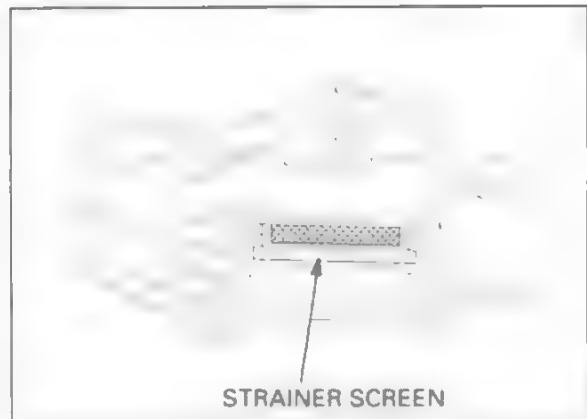
## OIL STRAINER SCREEN

### CLEANING

Separate the crankcase (page 11-4).

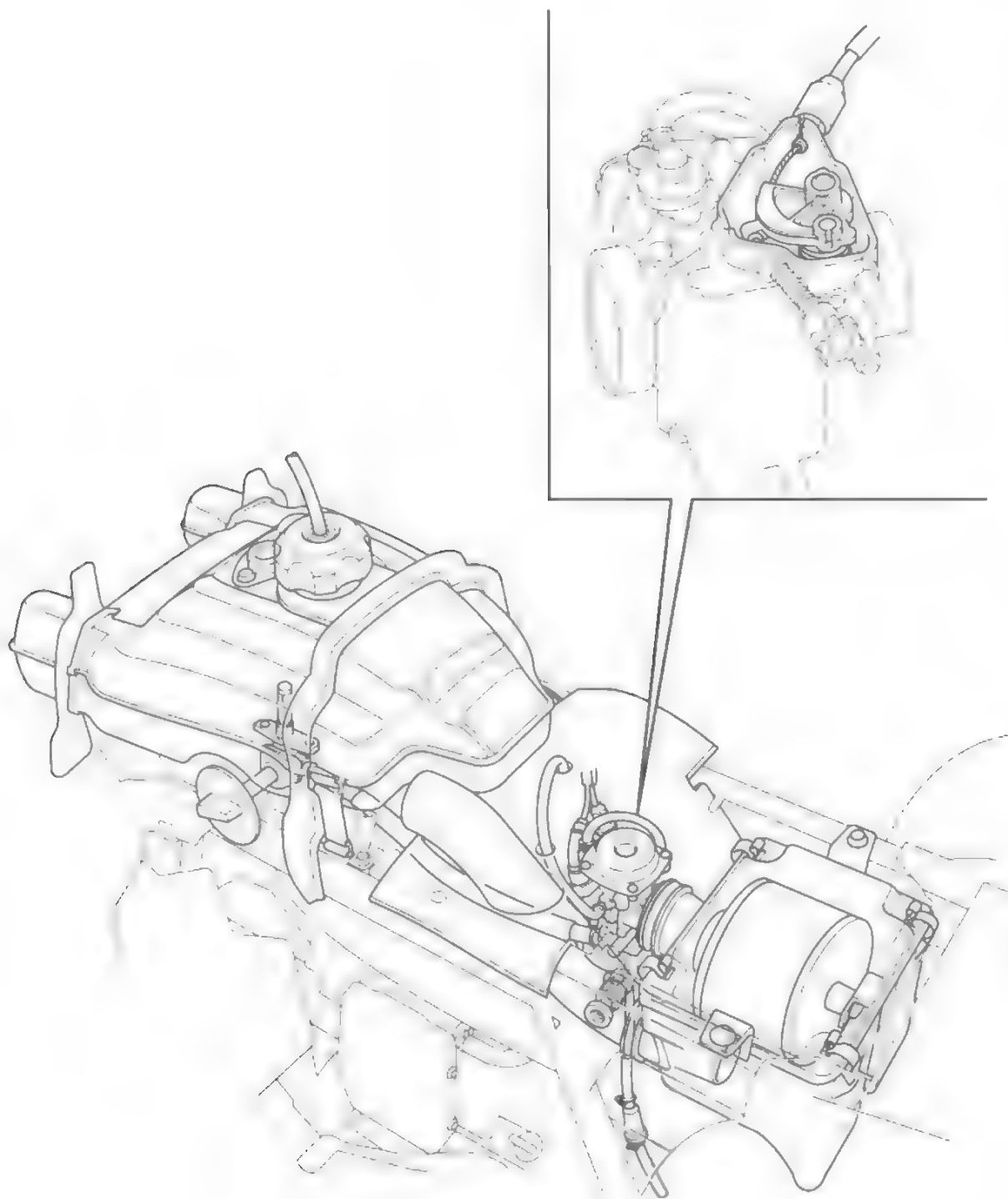
Remove the oil strainer screen and clean it.  
Install the oil strainer screen.

Assemble the crankcase (page 11-16).



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MEMO



# 5. FUEL SYSTEM

SERVICE INFORMATION	5-1	CARBURETOR INSTALLATION	5-16
TROUBLESHOOTING	5-3	PILOT SCREW ADJUSTMENT	5-17
AIR CLEANER HOUSING	5-4	HIGH ALTITUDE ADJUSTMENT	5-19
CARBURETOR REMOVAL	5-5	FUEL TANK REMOVAL	5-20
CARBURETOR DISASSEMBLY	5-6	FUEL STRAINER SCREEN	5-22
CARBURETOR ASSEMBLY	5-11	FUEL TANK INSTALLATION	5-22

5

## SERVICE INFORMATION

### GENERAL

#### WARNING

- *Gasoline is extremely flammable and is explosive under certain conditions. KEEP OUT OF REACH OF CHILDREN.*
- *If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*
- *Bending or twisting the control cables will impair smooth operation and could cause the cable to stick or bind, resulting in loss of vehicle control.*

- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.

#### CAUTION:

*Be sure to remove the diaphragms before cleaning air and fuel passages with compressed air. The diaphragms might be damaged.*

#### NOTE:

If the vehicle is to be stored for more than one month, drain the float chamber. Fuel left in the float chamber may cause clogged jets resulting in hard starting or poor driveability.

- Before disassembling the carburetor, place an approved gasoline container under the carburetor drain screw, loosen the screw and drain the carburetor.
- When disassembling the fuel system parts, note the locations of the O-rings. Replace them with new ones on reassembly.
- After removing the carburetor, wrap the intake port of the engine with a shop towel or cover it with a piece of tape to prevent any foreign material from dropping into the engine. Be sure to remove the cover when reinstalling the carburetor.

## FUEL SYSTEM

### SPECIFICATIONS

ITEM		STANDARDS
Carburetor identification number	'98 - '01:	VE93A
	After '01:	VE93C
Main jet	Initial	#130
	High altitude setting	#120
Slow jet		#45
Jet needle clip position		3 rd groove from top
Pilot screw	Initial opening	2-5/8 turns out
	High altitude setting	2-5/8 turns out
Float level		18.5 mm (0.73 in)
Engine idle speed		1,400 ± 100 rpm
Throttle level free play		3.0 - 8.0 mm (1/8 - 5/16 in)
Starting enrichment (SE) valve distance		10 - 11 mm (0.39 - 0.43 in)

### TORQUE VALUES

Carburetor cover screw	4 N•m (0.4 kgf•m, 13 lbf•ft)
Starting enrichment (SE) valve nut	3 N•m (0.3 kgf•m, 2 lbf•ft)
Fuel valve mounting bolt	9 N•m (0.9 kgf•m, 6.5 lbf•ft)
Fuel level gauge mounting bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)

### TOOL

Carburetor float level gauge	07401-0010000
Pilot screw wrench	07908-4220202

## TROUBLESHOOTING

### Engine cranks but won't start

- No fuel to carburetor
- Engine flooded with fuel
- No spark at plug (ignition system faulty)
- Clogged air cleaner
- Intake air leak
- Improper choke operation
- Improper throttle operation

### Engine idles roughly, runs poorly stalls

- Improper choke operation
- Ignition malfunction
- Fuel contaminated
- Intake air leak
- Incorrect idle speed
- Incorrect pilot screw adjustment
- Starting enrichment (SE) valve stuck open
- Damaged starting enrichment (SE) valve seat
- Low cylinder compression
- Rich mixture
- Lean mixture
- Clogged carburetor

### Misfiring during acceleration

- Ignition system faulty
- Lean mixture

### Afterburn during acceleration

- Ignition system faulty
- Lean mixture

### Poor performance (driveability) and poor fuel economy

- Fuel system clogged
- Ignition system faulty
- Air cleaner clogged

### Afterfiring

- Ignition system malfunction
- Carburetor malfunction
- Lean mixture
- Rich mixture

### Lean mixture

- Clogged fuel jets
- Faulty float valve
- Float level too low
- Blocked fuel fill cap air vent hole
- Clogged fuel strainer screen
- Restricted fuel line
- Clogged air vent tube
- Intake air leak

### Rich mixture

- Clogged air cleaner
- Worn jet needle or needle jet
- Faulty float valve
- Float level too high
- Clogged air jet
- Starting enrichment (SE) valve stuck open
- Damaged starting enrichment (SE) valve seat

### Incorrect fast idle speed

- Incorrect choke cable free play
- Starting enrichment (SE) valve stuck or damaged

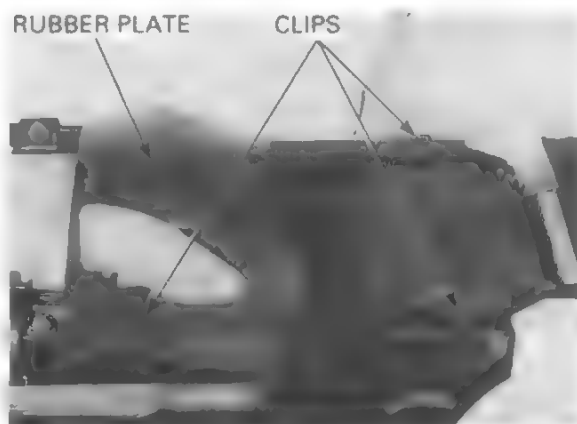


## AIR CLEANER HOUSING

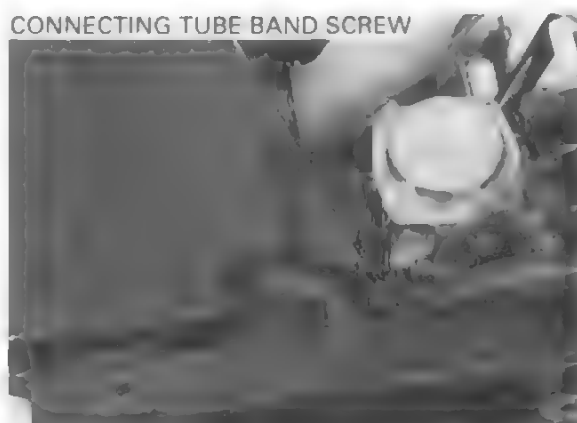
### REMOVAL

Remove the seat and side/fuel tank cover (page 2-3).

Remove the retaining clips and rubber plate.



Loosen the connecting tube band screw.



Disconnect the breather tube from the crankcase.



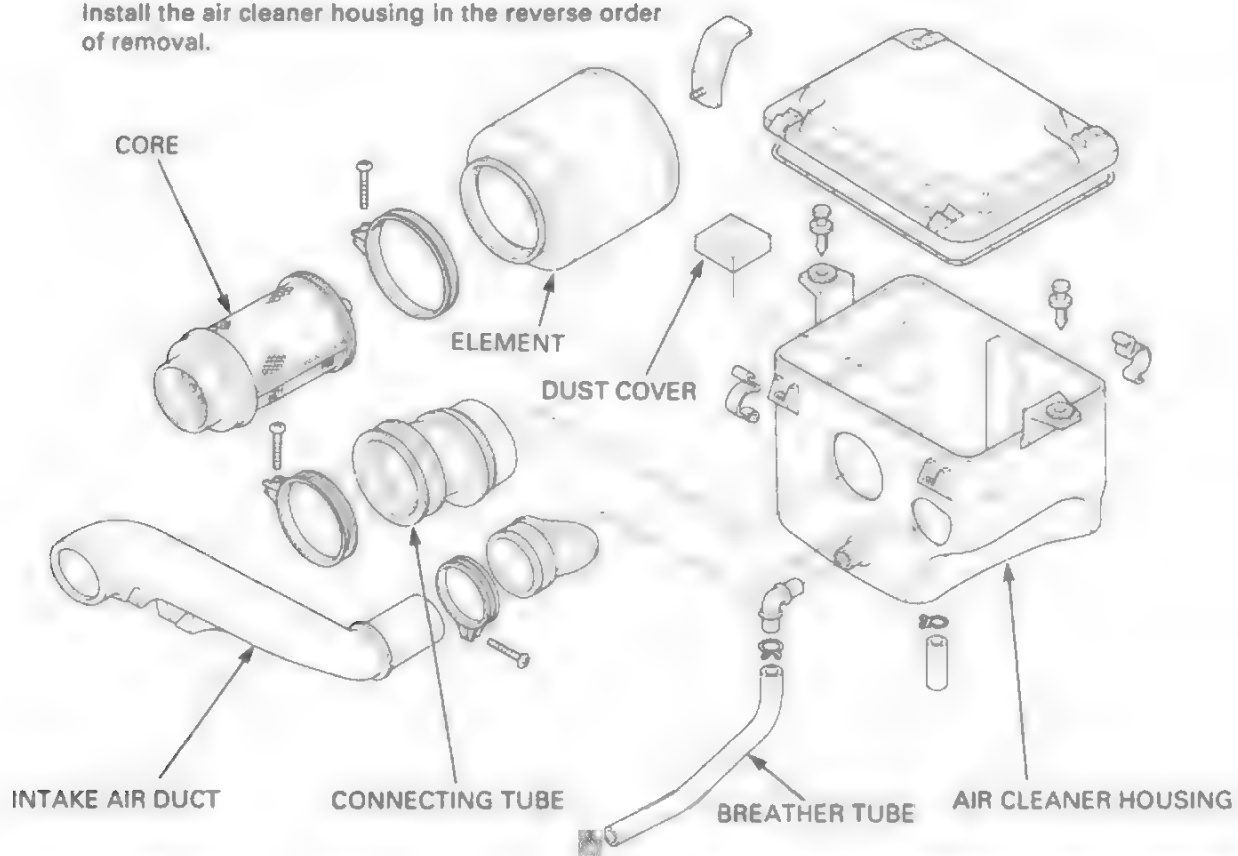
Free the intake duct from the frame.

Remove the air cleaner housing.



## INSTALLATION

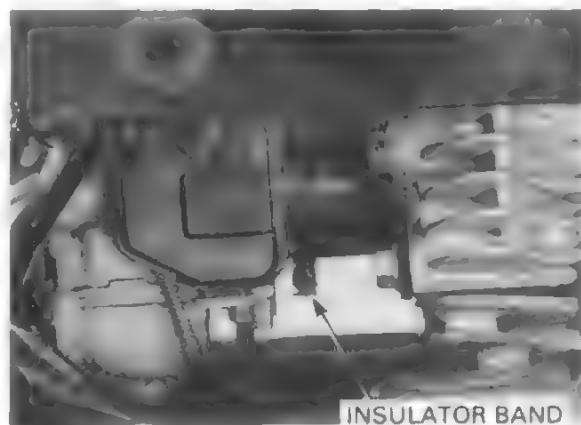
Install the air cleaner housing in the reverse order of removal.



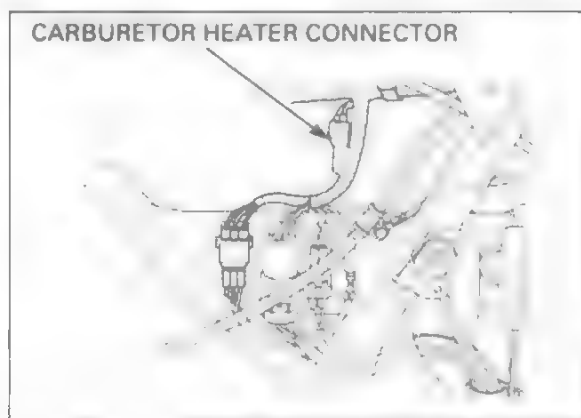
## CARBURETOR REMOVAL

Remove the air cleaner housing (page 5-4).

Loosen the insulator band screw.



Disconnect the carburetor heater connector.



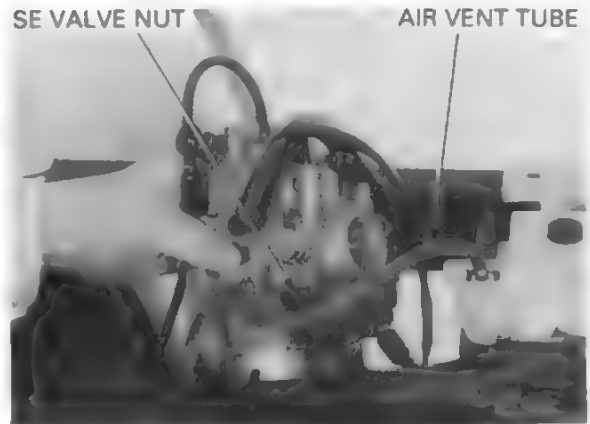
## FUEL SYSTEM

Pull the carburetor upward.

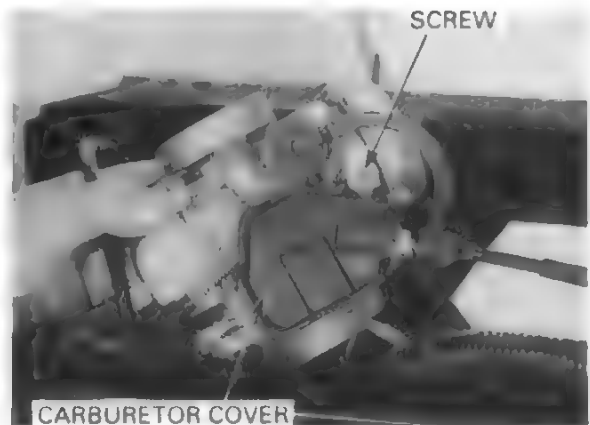
### CAUTION:

*Do not let dirt and dust enter the engine through the intake port, or the engine may be damaged.*

Loosen the starting enrichment (SE) valve nut and remove the SE valve from the carburetor. Disconnect the air vent tube from the heat guard.



Remove the carburetor cover screw and the cover.



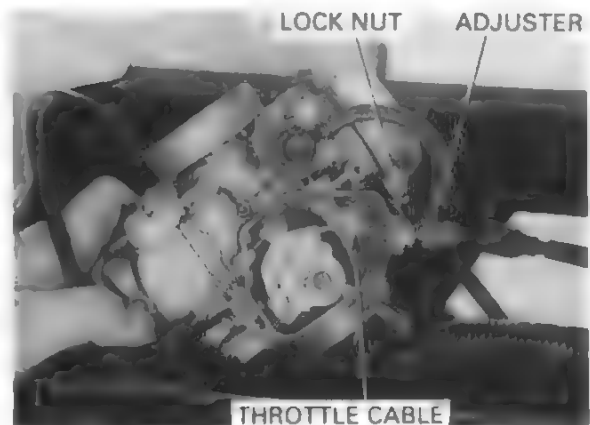
Disconnect the throttle cable end from the throttle drum.

Remove the throttle cable from the carburetor body by loosening the lock nut and turning the adjuster.

### CAUTION:

*Do not kink or twist the throttle cable. It will not operate smoothly and may stick if it is kinked or twisted.*

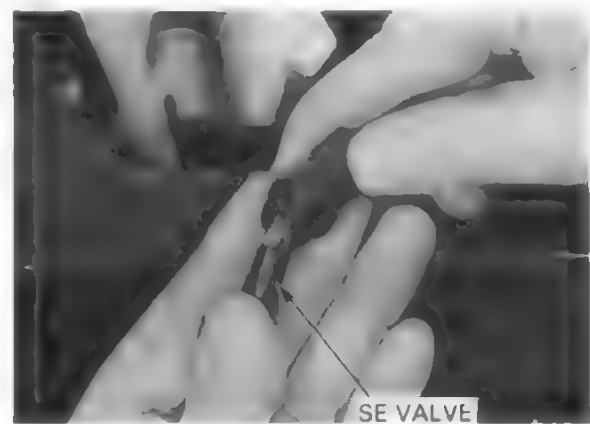
Remove the carburetor from the frame.



## CARBURETOR DISASSEMBLY

### STARTING ENRICHMENT (SE) VALVE

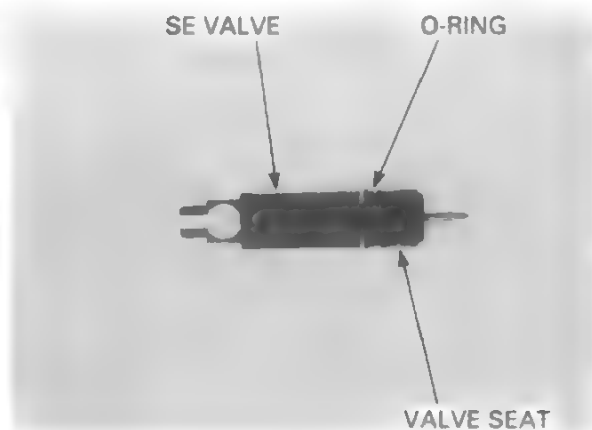
Disconnect the choke cable end from the SE valve and remove the valve spring.



Check the valve for nicks, grooves or other damage.  
Check the valve seat for wear.  
Check the O-ring for wear or damage.

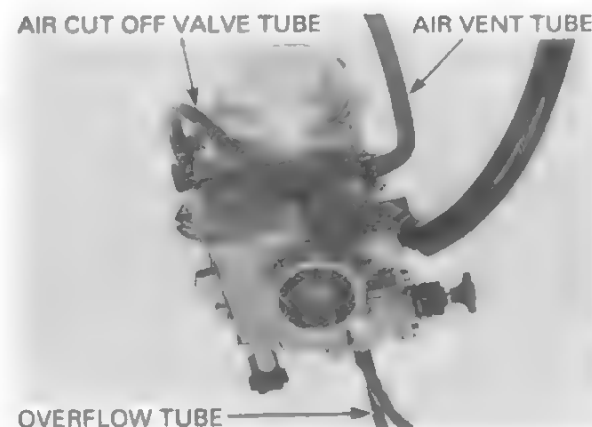
## NOTE:

The SE valve and O-ring must be replaced as a set.



## FLOAT AND JETS

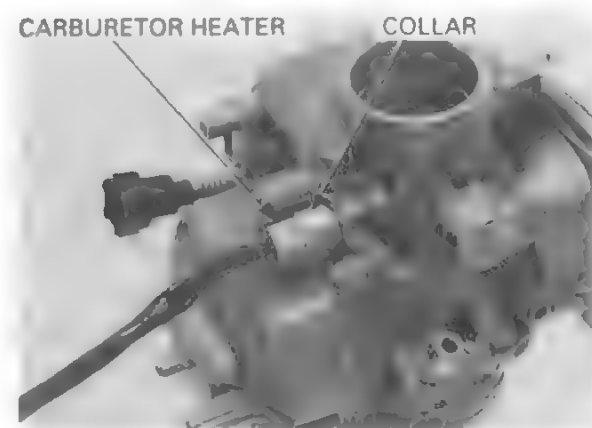
Disconnect the air vent tube, air cut off valve tube and overflow tube from the carburetor body.



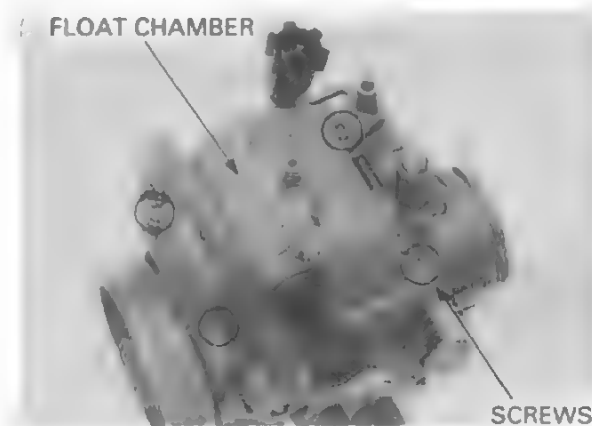
## Carburetor Heater

Remove the carburetor heater and collar.

For carburetor heater inspection, see page 20-17.



Remove the four screws and the float chamber.



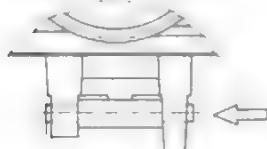
## FUEL SYSTEM

Remove the following:

- 98 - '00 - Baffle plate
- Float pin
- Float
- Float valve

After '00 Remove the float pin by gently tapping with a suitable pin driver (O.D. 2 mm) and hammer.

After '00 SHOWN



(VIEW FROM  
AIR CLEANER  
HOUSING SIDE)

Inspect the float valve for grooves and nicks, and replace if necessary.

Inspect the operation of the valve.

Remove the following:

- Main jet
- Needle jet holder
- Needle jet
- Slow jet
- Plug
- Starter jet

Turn the pilot screw in and record the number of turns before it seats lightly. Use this as a reference for reinstallation.

### CAUTION:

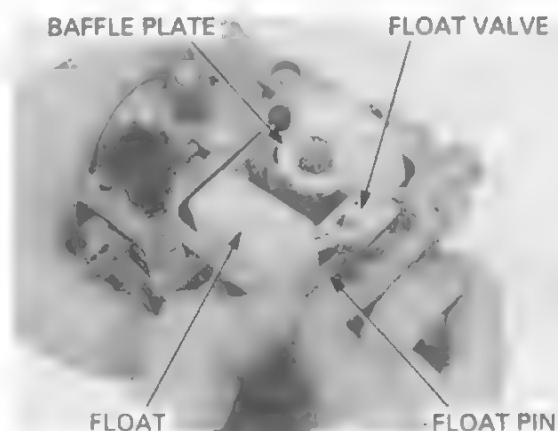
*Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.*

Remove the pilot screw.

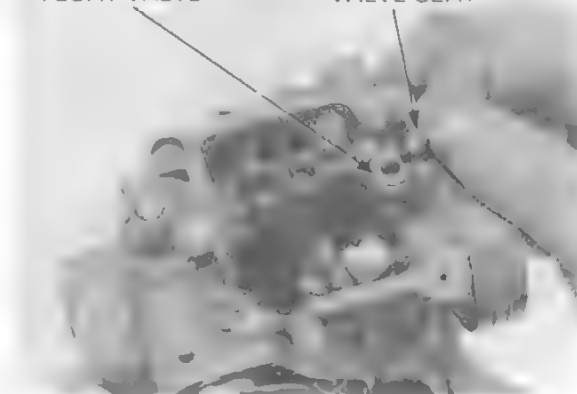
Inspect the pilot screw and each jet and replace them if they are worn or damaged.

### PRIMER KNOB

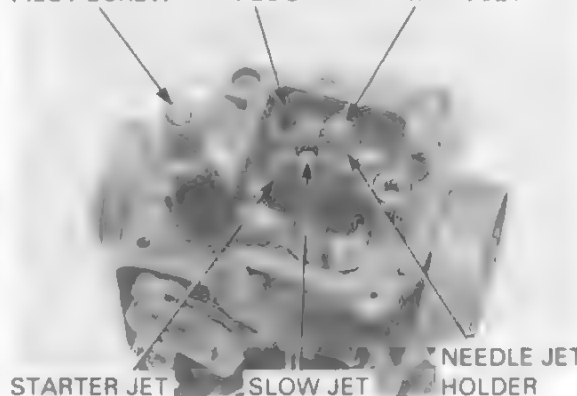
Remove the two screws.



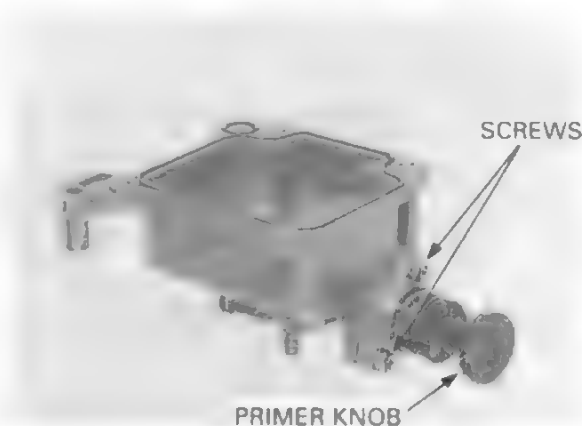
FLOAT VALVE VALVE SEAT



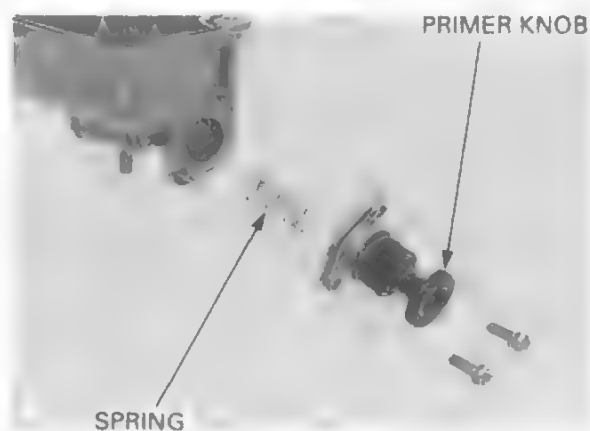
PILOT SCREW PLUG MAIN JET



STARTER JET SLOW JET NEEDLE JET HOLDER



Remove the primer knob and spring.



Check the diaphragm for tears or other damage.

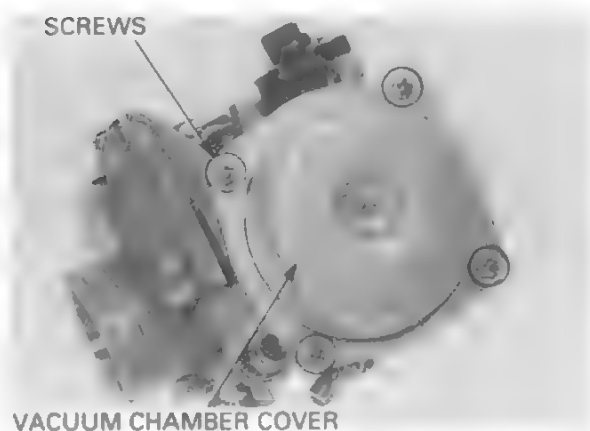


## DIAPHRAGM/VACUUM PISTON

### NOTE:

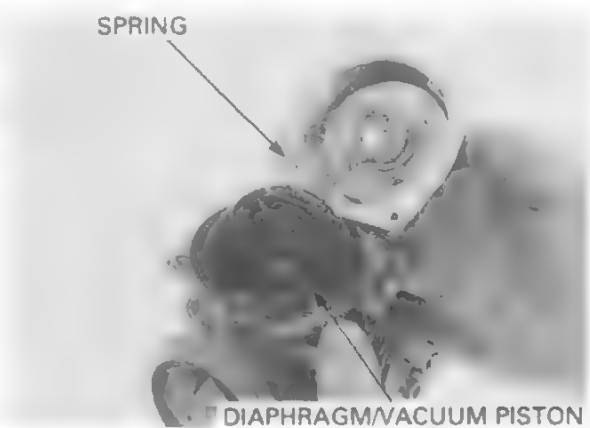
The diaphragm/vacuum piston can be removed without removing the float chamber.

Remove the vacuum chamber cover by removing the four screws.



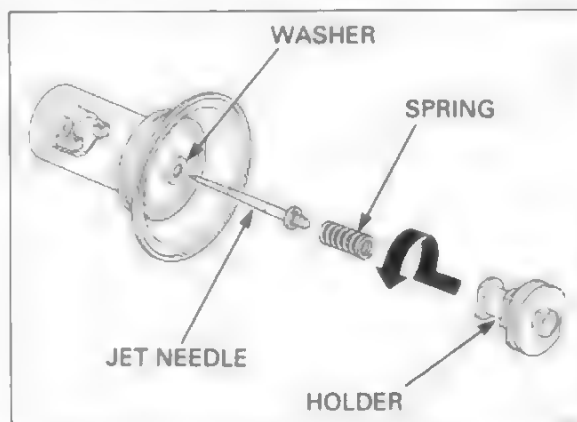
Remove the compression spring and diaphragm/vacuum piston.

Inspect the vacuum piston for wear, nicks, or other damage.  
Make sure the piston moves up and down freely in the chamber.



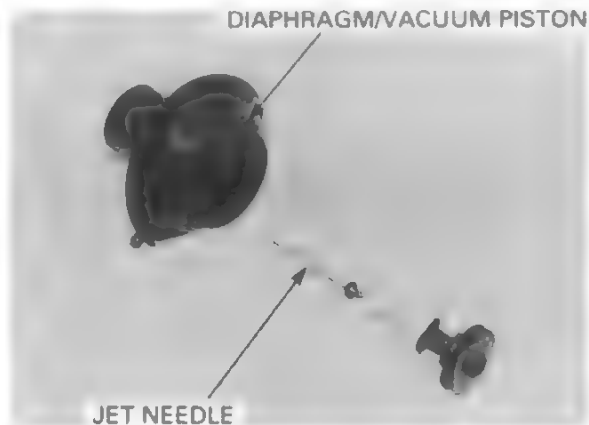
## FUEL SYSTEM

Push the jet needle holder down and turn it counterclockwise 90 degrees with a screwdriver. Then remove the needle holder, spring, jet needle and washer from the diaphragm/vacuum piston.



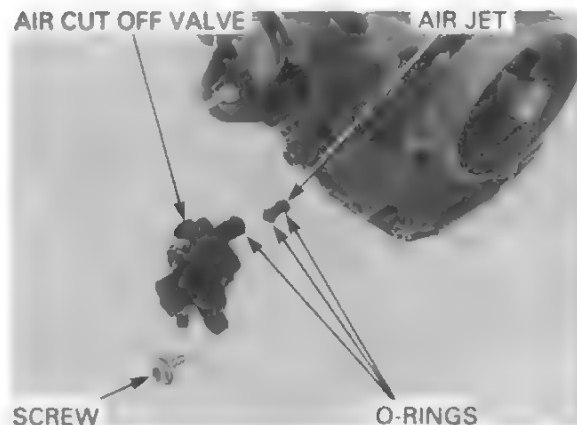
Inspect the jet needle for excessive wear at the tip or other damage.

Check for a torn diaphragm or other deterioration.

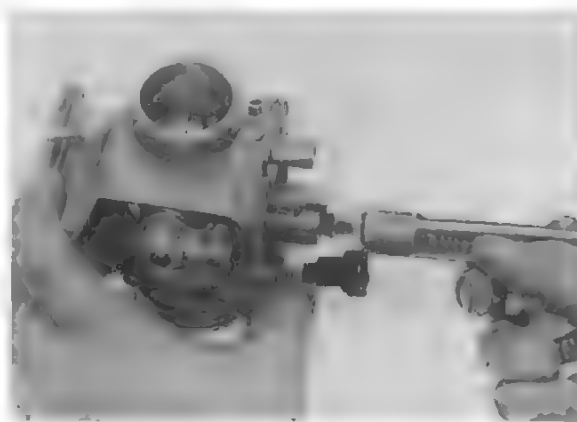


### AIR CUT OFF VALVE

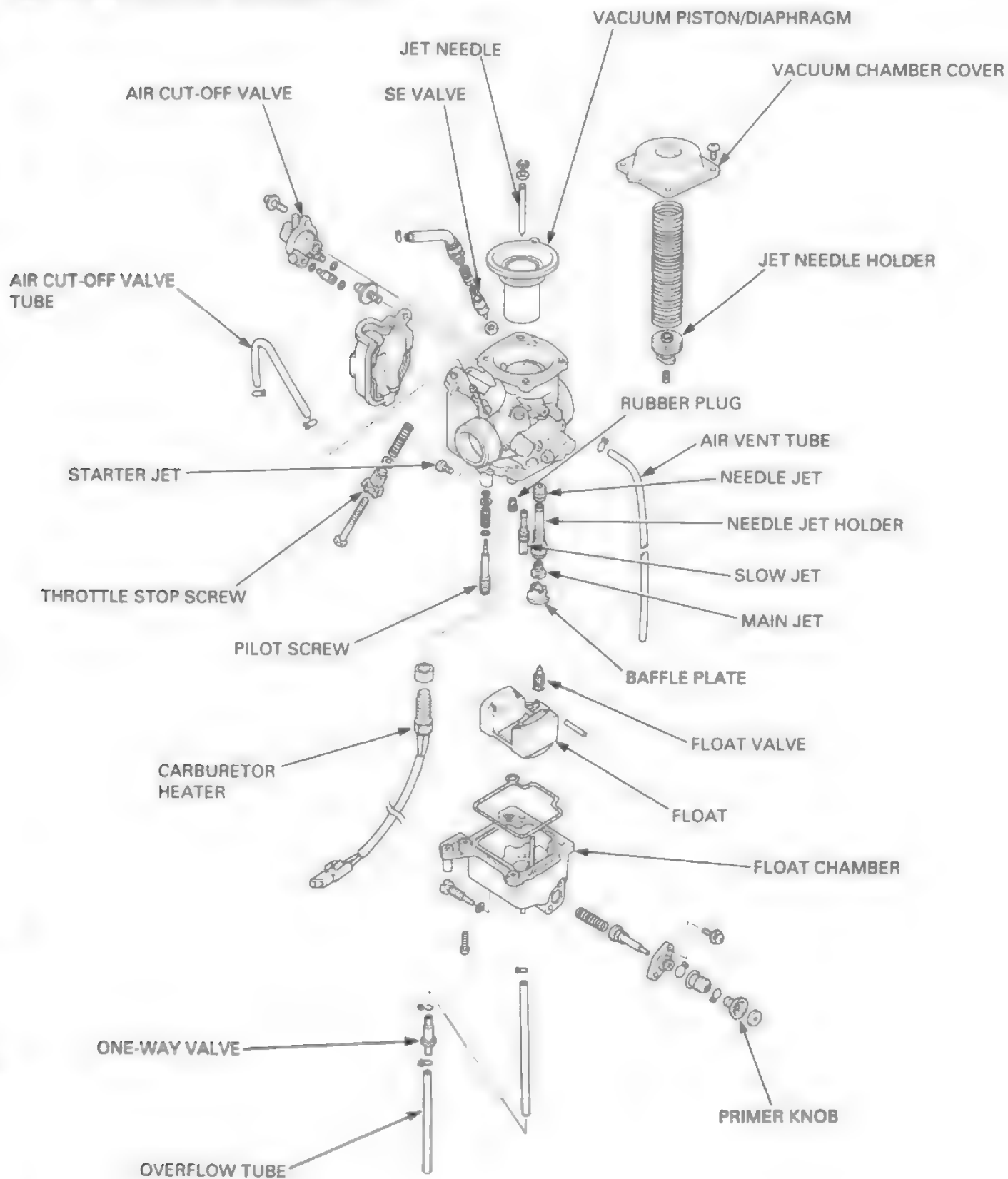
Remove the screw, air cut off valve, air jet and O-rings.



Blow open all carburetor body openings with compressed air.



## CARBURETOR ASSEMBLY





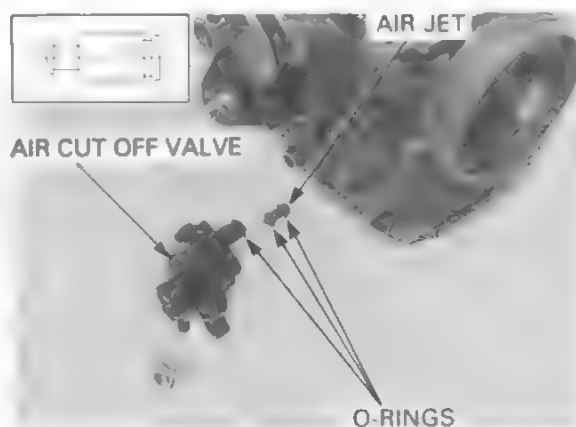
## FUEL SYSTEM

### AIR CUT OFF VALVE

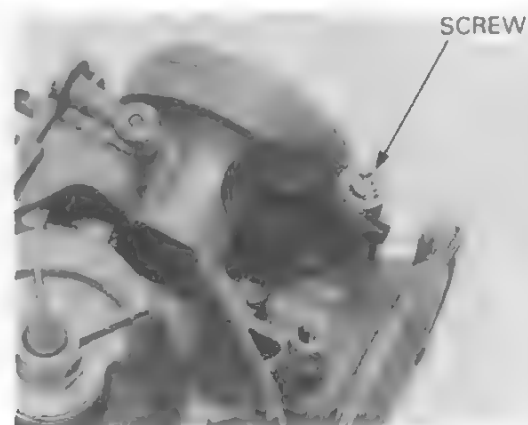
Install the O-rings, air jet and air cut off valve.

#### NOTE:

Note the direction of the air jet as shown.



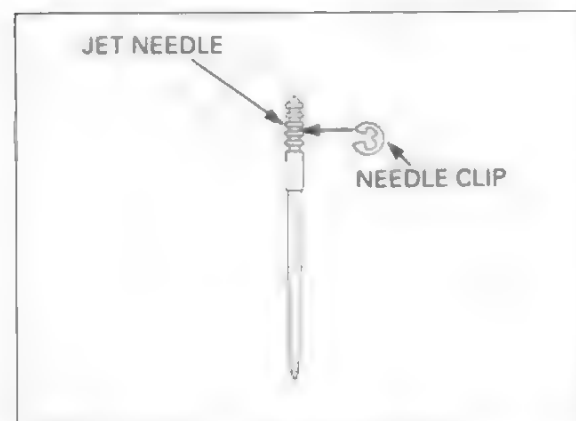
Install and tighten the screw securely.



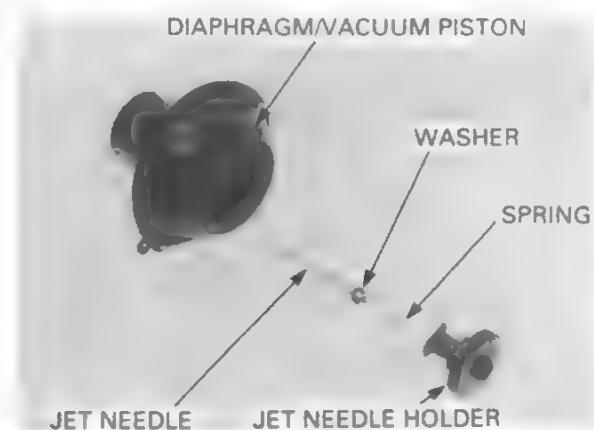
### DIAPHRAGM/VACUUM PISTON

Install the needle clip on the jet needle.

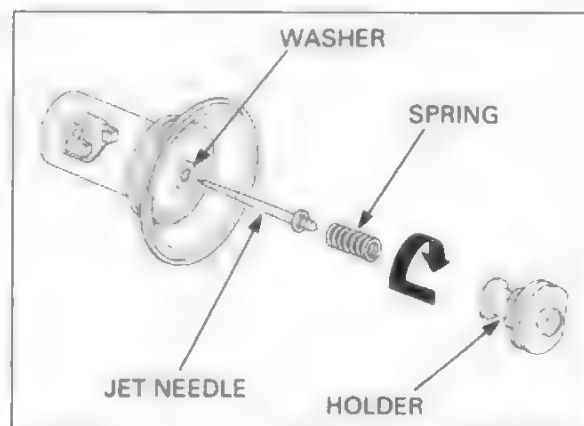
**STANDARD SETTING:** 3rd groove from top



Install the washer, jet needle, spring and jet needle holder to the vacuum piston.

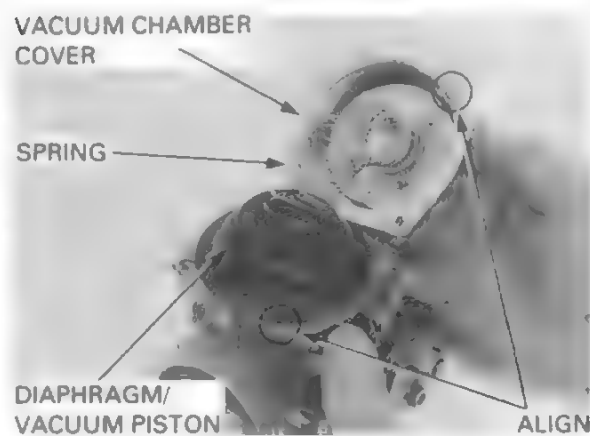


Push the jet needle holder in and turn it 90 degrees clockwise.



Install the diaphragm/vacuum piston in the carburetor body, aligning the diaphragm tab with the groove of the carburetor body. Hold the vacuum piston up to almost full open so the diaphragm is not pinched by the chamber cover.

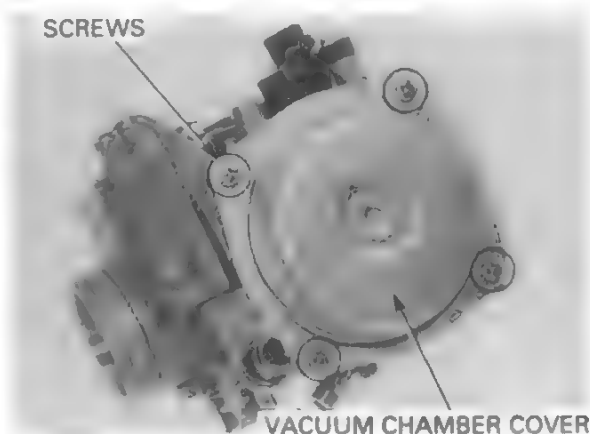
Install the chamber cover with the spring, aligning its tab with the hole in the carburetor, and secure with at least two screws before releasing the vacuum piston.



Install the remaining vacuum chamber cover screws.

## CAUTION:

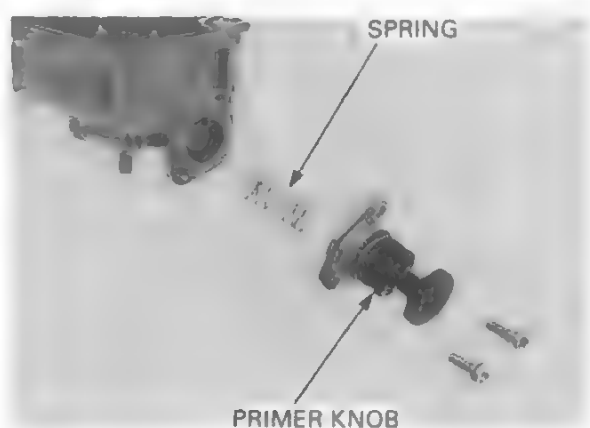
*Do not pinch the diaphragm under the chamber cover.*



## PRIMER KNOB

Install the primer knob with the spring into the float chamber.

Do not pinch the diaphragm when installing the screws.



Tighten the screws securely.

### FLOAT AND JETS

Install the following:

- Starter jet
- Plug
- Slow jet
- Needle jet, needle jet holder
- Main jet

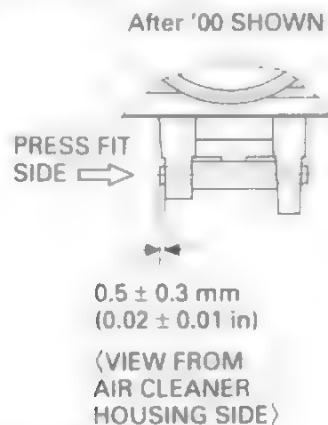
#### CAUTION:

*Handle all jets with care. They can easily be scored or scratched.*

Install the pilot screw and return it to its original position as noted during removal. Perform pilot screw adjustment if a new pilot screw is installed (page 5-17).

Install the float and float valve in the carburetor body, then install the float arm pin through the body and float.

After '00 Install the float pin by gently tapping with a suitable pin driver (O.D. 2 mm) and hammer.



### FLOAT LEVEL INSPECTION

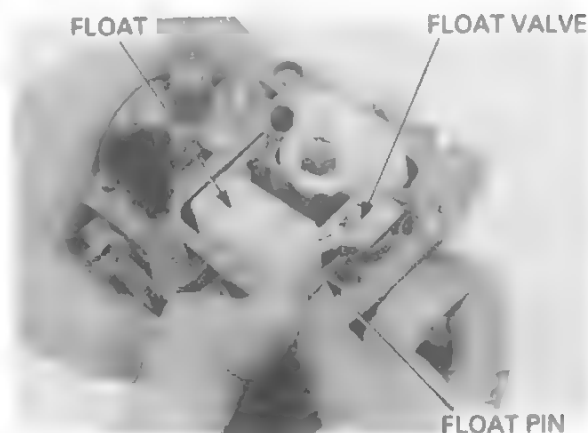
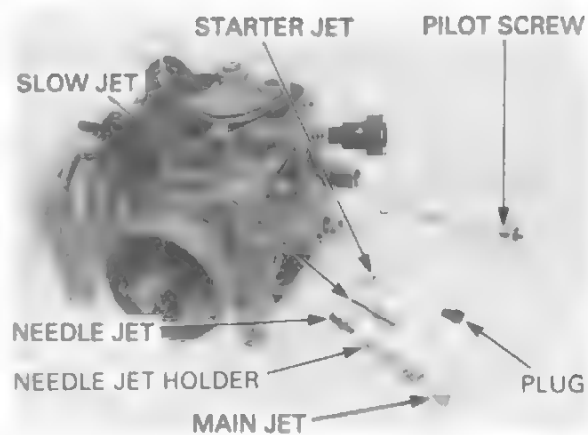
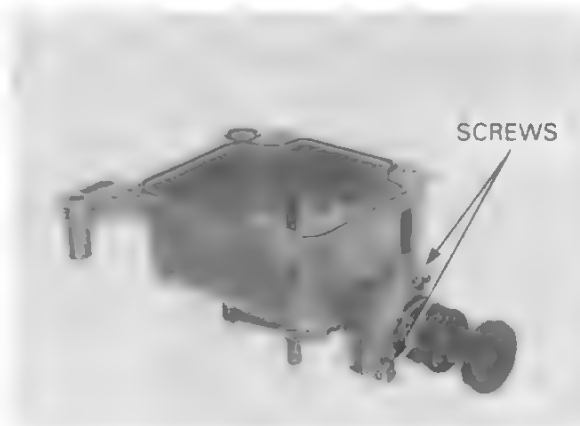
With the float valve seated and the float arm just touching the valve, measure the float level with the special tool as shown.

**FLOAT LEVEL:** 18.5 mm (0.73 in)

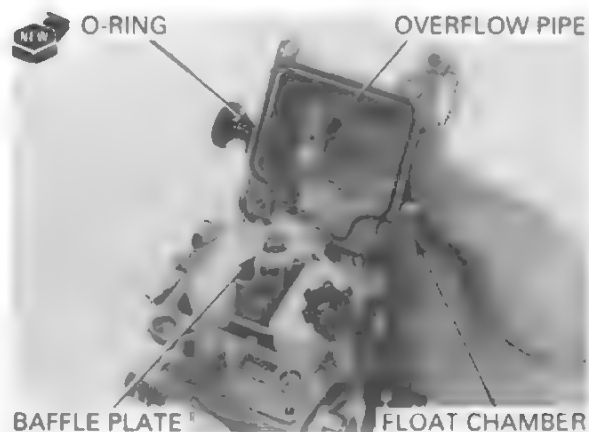
#### TOOL:

Carburetor float level gauge 07401-0010000

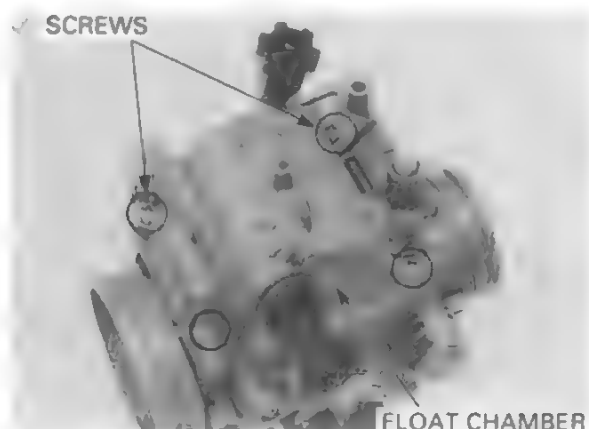
The float cannot be adjusted. Replace the float assembly if the float level is out of specification.



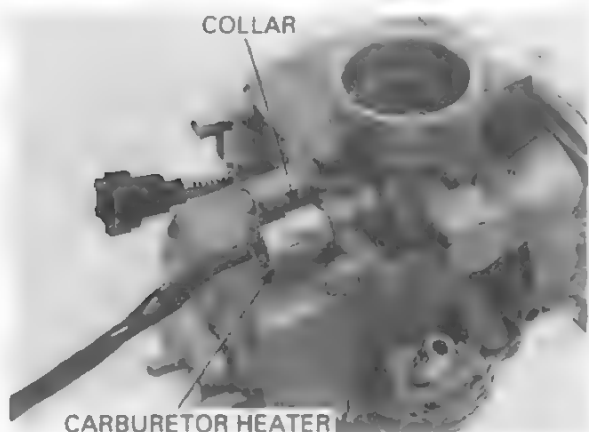
Install the baffle plate.  
Install a new O-ring in the float chamber.  
Install the float chamber, aligning the overflow pipe with the hole in the baffle as shown.



Install the four float chamber screws.



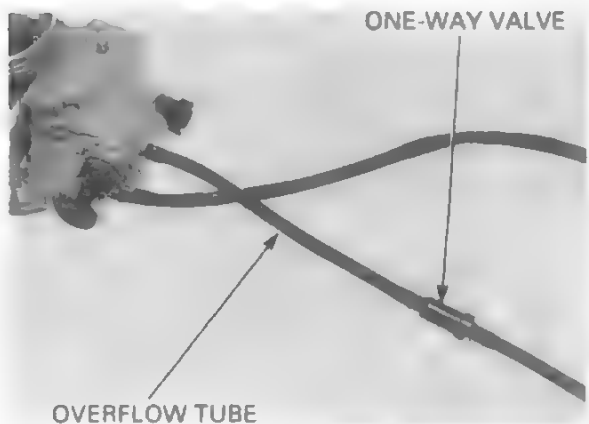
Install the carburetor heater and collar.



Install the overflow tube.

NOTE:

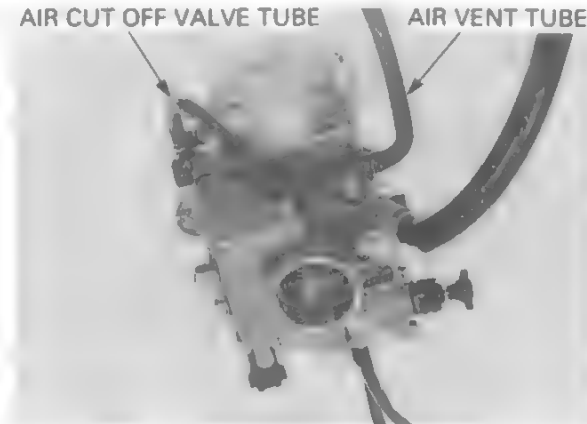
Note the direction of the one-way valve.



## FUEL SYSTEM

Install the air vent tube and air cut off valve tube.

AIR CUT OFF VALVE TUBE      AIR VENT TUBE

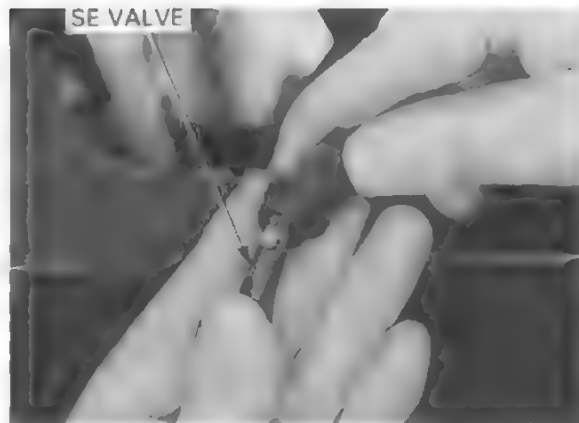


### STARTING ENRICHMENT (SE) VALVE

Install the spring over the choke cable and connect the cable end to the SE valve.

**TRX450S** Move the choke lever all the way to the right and left and make sure that the SE valve operates properly.

**TRX450ES** Move the choke knob all the way to pull and push and make sure that the SE valve operates properly.



## CARBURETOR INSTALLATION

Install the throttle cable adjuster to the carburetor body.  
Connect the throttle cable end to the throttle drum.

### CAUTION:

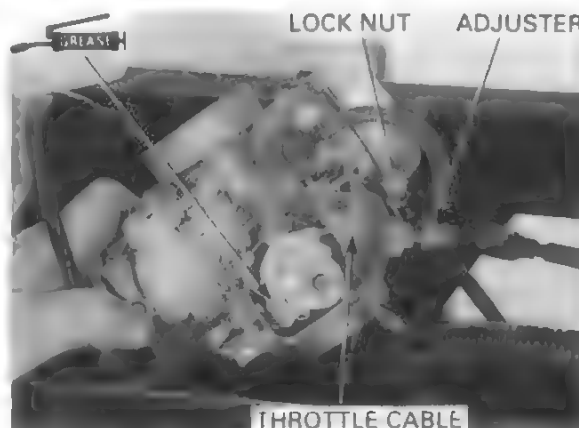
*Do not kink or twist the throttle cable. It will not operate smoothly and may stick if it is kinked or twisted.*

### NOTE:

Apply grease to the throttle cable end.

Install the carburetor cover and tighten the screw.

**TORQUE: 4 N·m (0.4 kgf·m, 3 lbf·ft)**

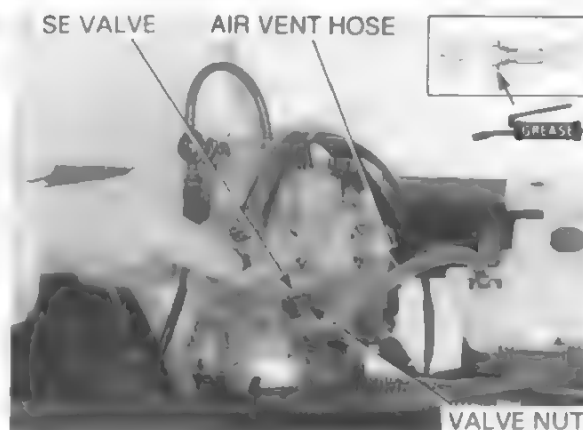


Apply multi-purpose grease to the SE valve end as shown.

Install the SE valve and tighten the valve nut.

**TORQUE: 3 N·m (0.3 kgf·m, 1.8 lbf·ft)**

Connect the air vent hose into the hole on the heat guard.



Install the carburetor by aligning its intake pipe boss with the insulator groove.

Set the pin of the insulator band in the groove of the insulator and install the band.



Tighten the insulator band screw.

*After '01:* **TORQUE: 4 N·m (0.4 kgf·m, 2.9 lbf·ft)**

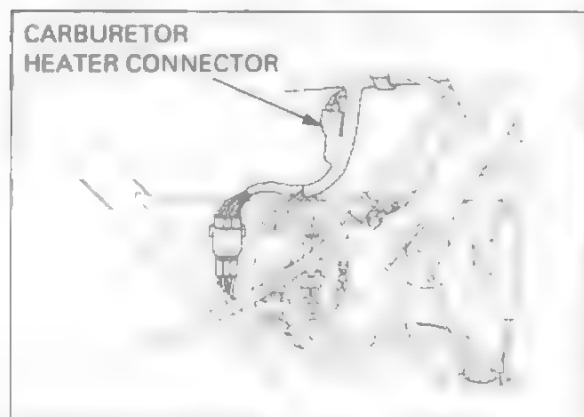


Connect the carburetor heater connector.

Route the drain hose correctly (page 1-29).

Adjust the throttle lever free play (page 3-4).

Install the removed parts in the reverse order of removal.



### PILOT SCREW ADJUSTMENT

#### **⚠ WARNING**

*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

#### **NOTE:**

- The pilot screw is factory pre-set. Adjustment is not necessary unless the carburetors are overhauled or new pilot screws are installed.
- Then engine must be warm for accurate adjustment. Ten minutes of stop-and-go riding is sufficient.
- Use a tachometer with graduations of 50 rpm or smaller that will accurately indicate 50 rpm change.

1. Turn the pilot screw clockwise until it seats lightly, then back it out to the specification given.

#### **CAUTION:**

*Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.*

#### **TOOL:**

Pilot screw wrench                      07908-4220201

#### **INITIAL OPENING: 2-5/8 turns out**

2. Warm the engine up to operating temperature.
3. Stop the engine and connect a tachometer according to the tachometer manufacture's instructions.
4. Start the engine and adjust the idle speed with the throttle stop screw.

#### **IDLE SPEED: 1,400 ± 100 rpm**

5. Turn the pilot screw in or out slowly to obtain the highest engine speed.
6. Readjust the idle speed with the throttle stop screw.
7. Turn the pilot screw in gradually until the engine speed drops 100 rpm.
8. Turn the pilot screw counterclockwise the number of turns to the specification given.

#### **FINAL OPENING: 1/2 turns out**

9. Readjust the idle speed with the throttle stop screw.



## HIGH ALTITUDE ADJUSTMENT

### SPECIFICATIONS

	Below 5,000 ft (1,500 m)	Between 3,000 – 8,000 ft (1,000 – 2,500 m)
Main jet	#130	#120

The carburetor must be adjusted for high altitude riding (between 3,000 – 8,000 ft/1,000 – 2,500 m).

#### STANDARD SETTING:

Below 5,000 ft (1,500 m)

#### HIGH ALTITUDE SETTING:

Between 3,000 – 8,000 ft (1,000 – 2,500 m)

The high altitude carburetor adjustment is performed as follows:

Remove the carburetor (page 5-5) and float chamber. Replace the standard main jet with the high altitude type.

#### HIGH ALTITUDE MAIN JET: #125

Assemble and install the carburetor.

Start the engine and adjust the idle speed at high altitude to ensure proper high altitude operation.

#### **⚠ WARNING**

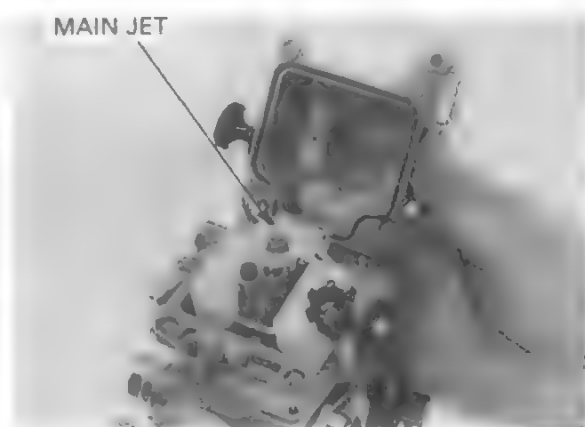
*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

#### CAUTION:

*Sustained operation below 5,000 feet (1,500 m) with the high altitude settings may cause engine overheating and engine damage. Install the standard main jet and adjust the idle speed with the throttle stop screw, when riding below 5,000 feet (1,500 m).*

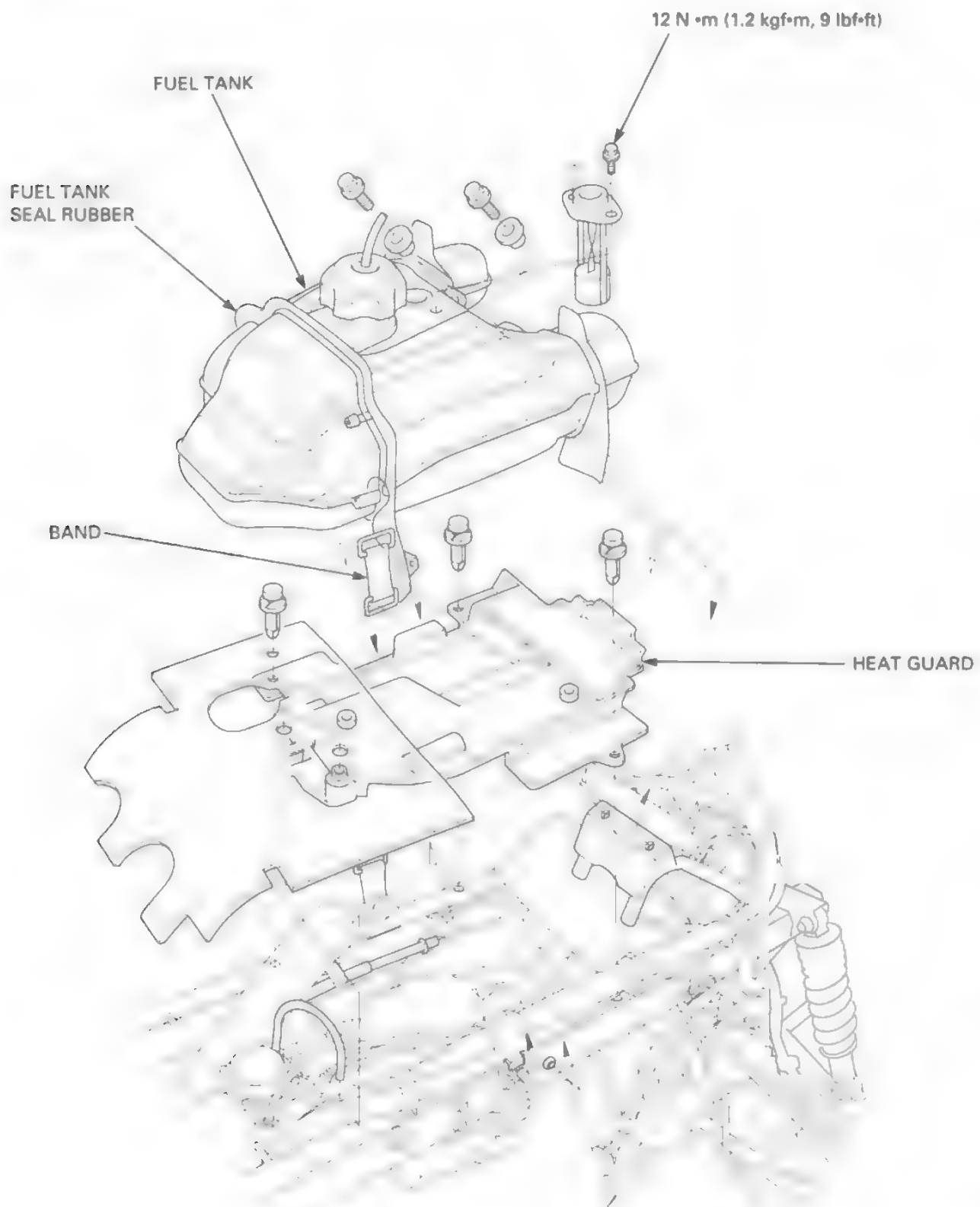
STANDARD MAIN JET: #130

IDLE SPEED: 1,400 ± 100 rpm





## FUEL TANK REMOVAL

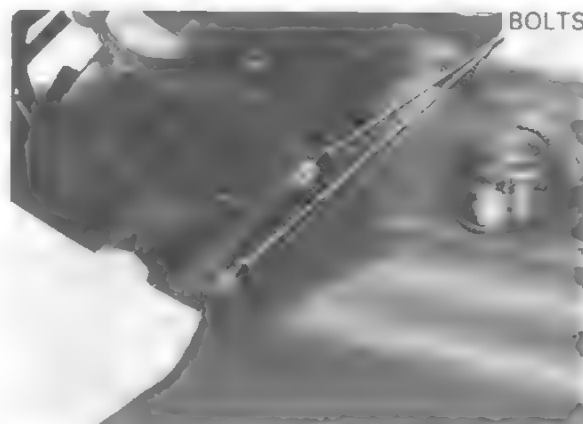


**⚠ WARNING**

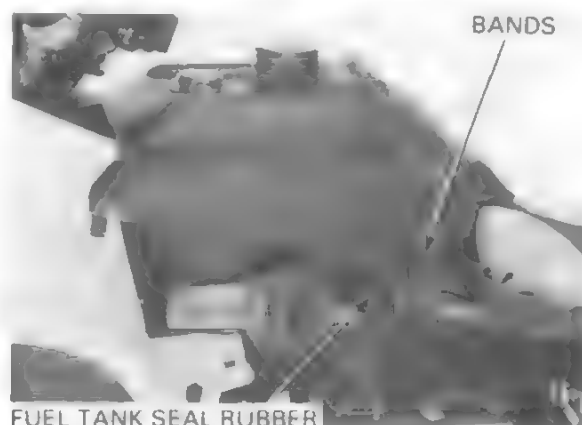
*Gasoline is extremely flammable and is explosive under certain conditions. KEEP OUT OF REACH OF CHILDREN.*

Turn the fuel valve off.  
Remove the side/fuel tank cover (page 2-4).

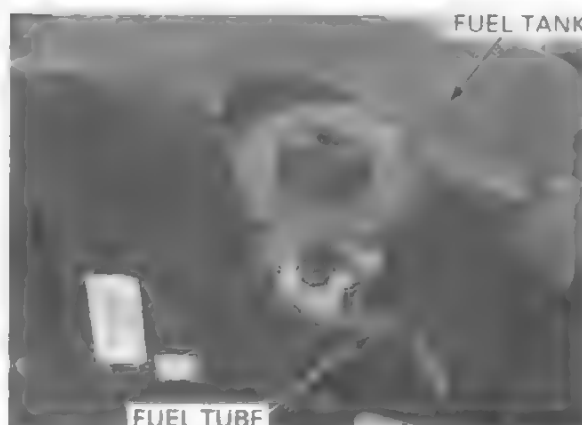
Remove the fuel tank mounting bolts.



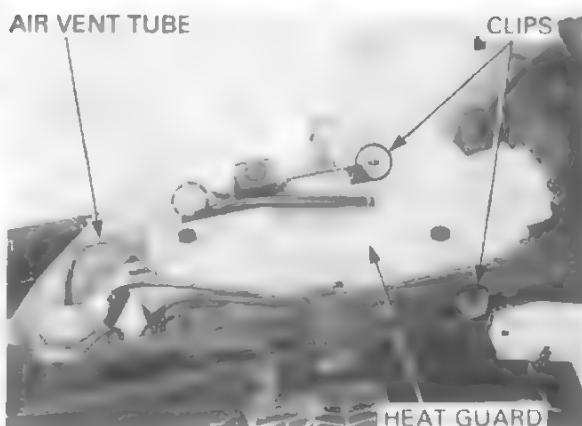
Remove the fuel tank seal rubber.  
Remove the fuel tank holder bands.



Slightly pull the fuel tank up, then disconnect the fuel tube from the fuel valve.  
Remove the fuel tank.



Disconnect the carburetor air vent tube from the fuel tank heat guard.  
Remove the three retaining clips and fuel tank heat guard.



### FUEL STRAINER SCREEN

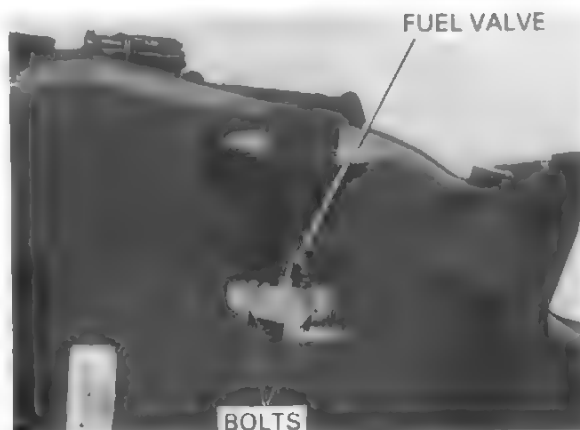
Turn the fuel valve OFF.  
Remove the fuel tank.  
Remove the fuel valve mounting bolts and fuel valve,  
and drain the gasoline into an approved gasoline  
container.

#### ⚠ WARNING

- *Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area with the engine stopped. Do not smoke or allow flames or sparks in your working area or where gasoline is stored.*
- *Wipe up spilled gasoline at once.*

Remove the O-ring and strainer screen.  
Wash the strainer screen in clean non-flammable  
or high flash point solvent.

Reinstall the screen.  
Install a new O-ring into the fuel valve body.

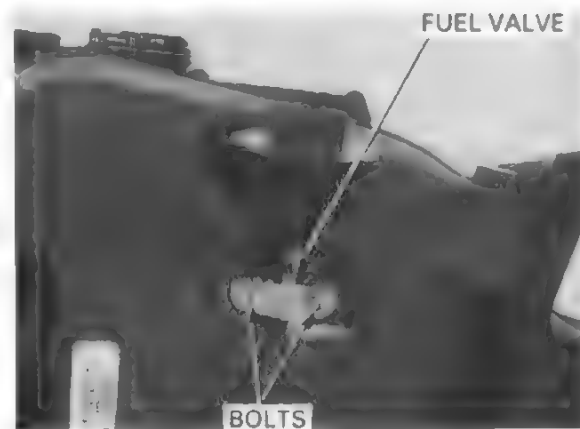


Reinstall the fuel valve and tighten the bolts to the  
specified torque.

**TORQUE: 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**

Connect the fuel tube.

After installing, turn the fuel valve ON and check  
that there are no fuel leaks.



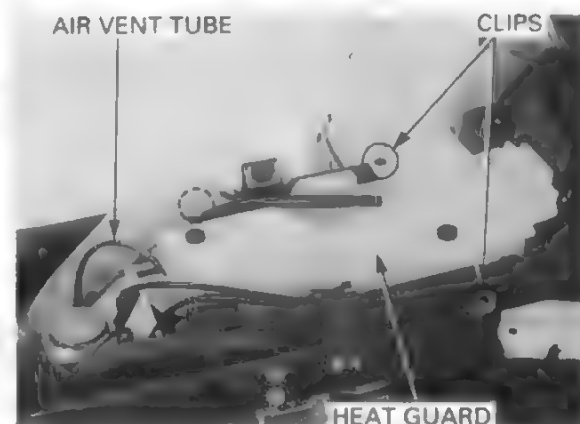
### FUEL TANK INSTALLATION

Set the fuel tank heat guard onto the frame, then  
install the front section of the heat guard into the  
frame.  
Install the retaining clips.

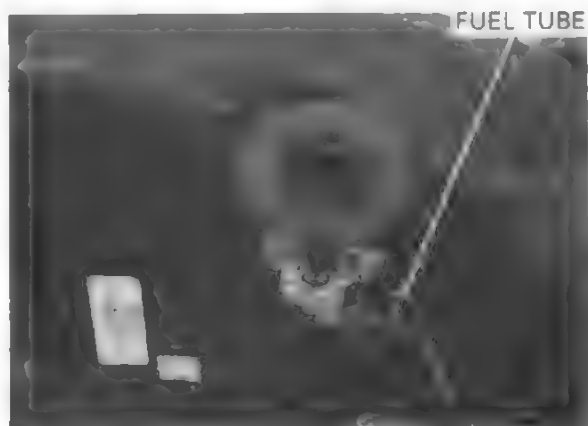
Connect the carburetor air vent tube.

#### NOTE:

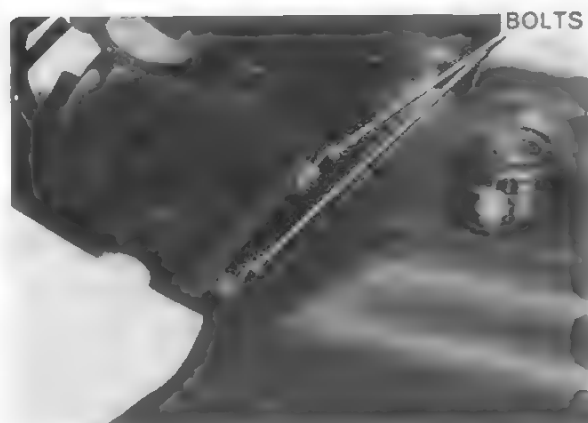
During heat guard installation, route the fuel tube  
and carburetor air vent tube properly.



Connect the fuel tube to the fuel valve.



Set the fuel tank onto the frame, install and tighten the mounting bolts.



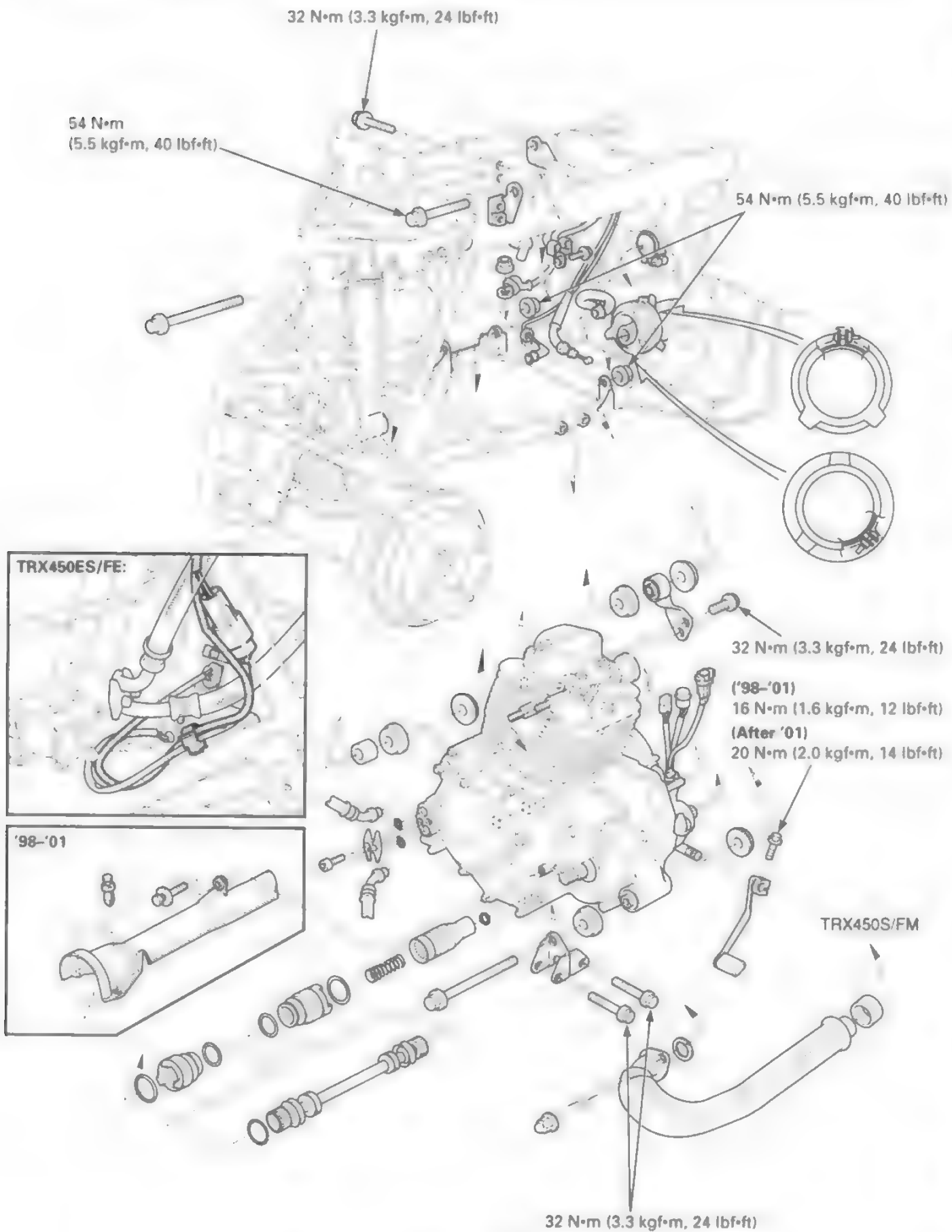
Install the fuel tank holder bands and fuel tank seal rubber.

**NOTE:**

After installation, make sure there are no fuel leaks.



## ENGINE REMOVAL/INSTALLATION



# 6. ENGINE REMOVAL/INSTALLATION

## SERVICE INFORMATION

6-1

## ENGINE INSTALLATION

6-6

## ENGINE REMOVAL

6-2

## SERVICE INFORMATION

### GENERAL

- The following components require engine removal for service.
  - Crankshaft (Section 11)
  - Transmission (Section 11)
  - Gearshift linkage (Section 9)
- The following components can be serviced with the engine installed in the frame.
  - Cylinder head/valves (Section 7)
  - Camshaft (Section 7)
  - Cylinder/piston (Section 7)
  - Clutch (Section 8)
  - Recoil starter/alternator/starter clutch (Section 10)
  - Carburetor (Section 5)
  - Oil pump (Section 4)
  - Control motor (Section 21)

6

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Engine oil capacity	At draining	2.0 ℓ (2.10 USqt, 1.76 imp qt)
	At disassembly	2.7 ℓ (2.84 USqt, 2.38 imp qt)
Engine dry weight		50.2 kg (110.7 lbs)

### TORQUE VALUES

Upper engine hanger bolt	54 N•m (5.5 kgf•m, 40 lbf•ft)
Upper engine hanger plate bolt	32 N•m (3.3 kgf•m, 24 lbf•ft)
Lower engine mounting bolt (right)	54 N•m (5.5 kgf•m, 40 lbf•ft)
Lower engine mounting bolt (left)	54 N•m (5.5 kgf•m, 40 lbf•ft)
Lower engine hanger mounting bolt	32 N•m (3.3 kgf•m, 24 lbf•ft)
Gear shift pedal bolt ('98 - '01)	16 N•m (1.6 kgf•m, 12 lbf•ft)
(After '01)	20 N•m (2.0 kgf•m, 14 lbf•ft)

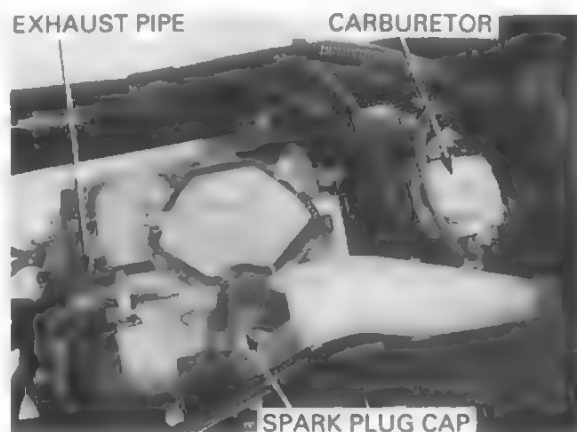
### ENGINE REMOVAL

Drain the engine oil (page 3-10).

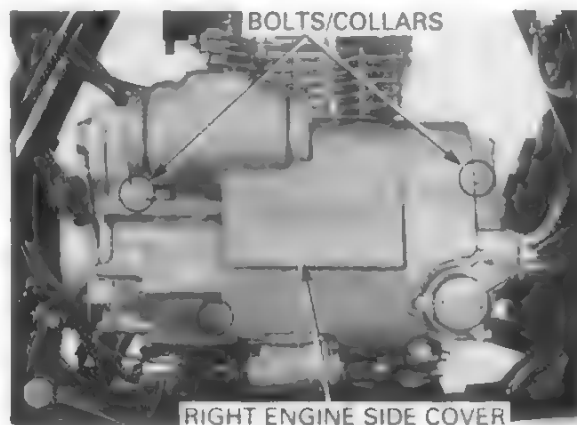
Remove the following:

- Exhaust pipe/Muffler (page 2-15)
- Front fender (page 2-6)
- Air cleaner housing (page 5-4)
- Carburetor (page 5-5)
- Fuel tank and fuel tank heat guard (page 5-20)

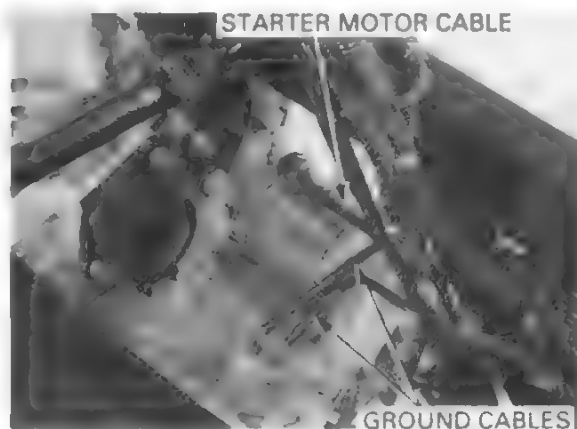
Disconnect the spark plug cap.



Remove the bolts, collars and right engine side cover.

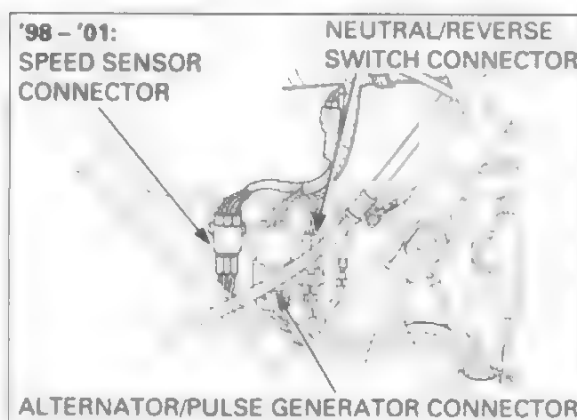


Remove the nut and starter motor cable.  
Remove the bolt and ground cable terminals.



**TRX450S FM** Disconnect the alternator, ignition pulse generator and neutral reverse switch connectors.

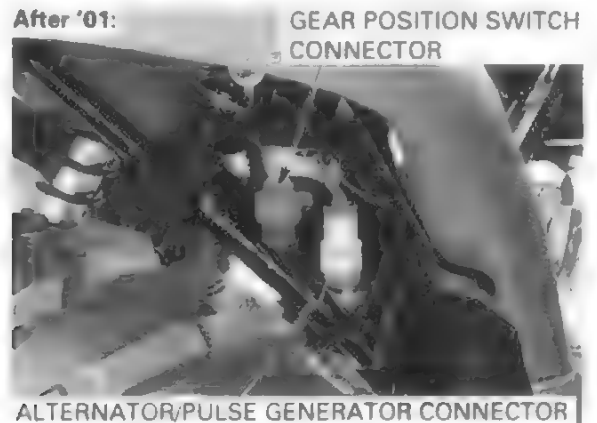
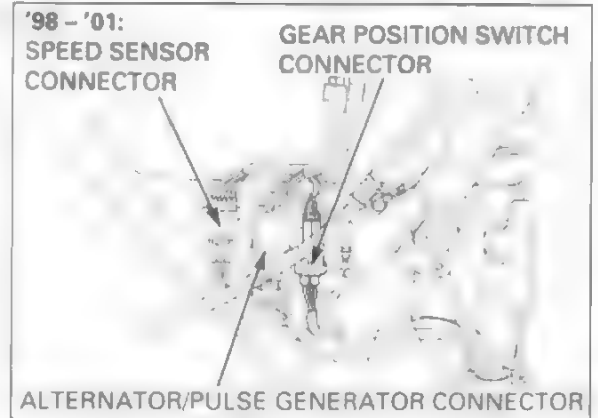
**'98 - '01** Disconnect the speed sensor connector and connector bracket from the frame stay.



## ENGINE REMOVAL/INSTALLATION

TRX450ES/FE Disconnect the alternator, ignition pulse generator and gear position switch connectors.

'98 - '01 Disconnect the speed sensor connector and connector bracket from the frame stay.

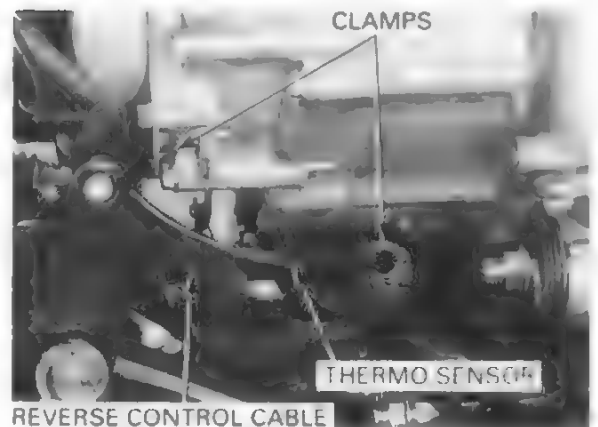


Disconnect the reverse control cable end from the lever.

Disconnect the oil thermo sensor connector from the sensor.

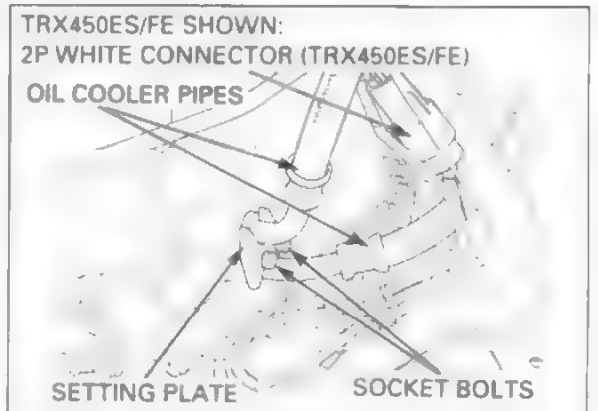
Release the thermo sensor and engine harness wire clamps.

Remove the wire clamp from the recoil starter cover.



Remove the socket bolts, setting plate, oil cooler pipes and O-rings.

TRX450ES/FE Disconnect the control motor connector (2P white).

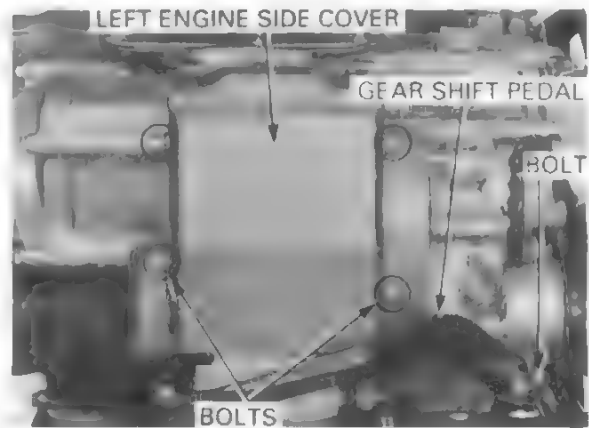




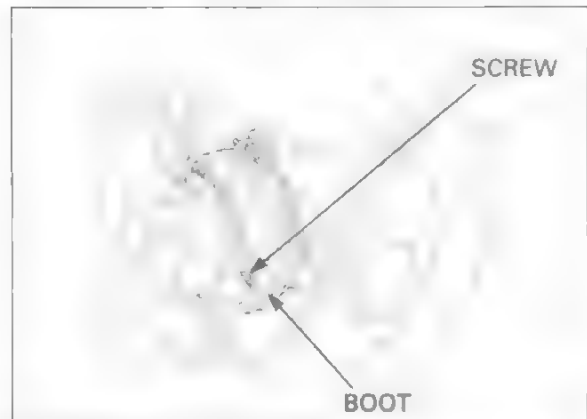
## ENGINE REMOVAL/INSTALLATION

Remove the bolts, collars and left engine side cover.

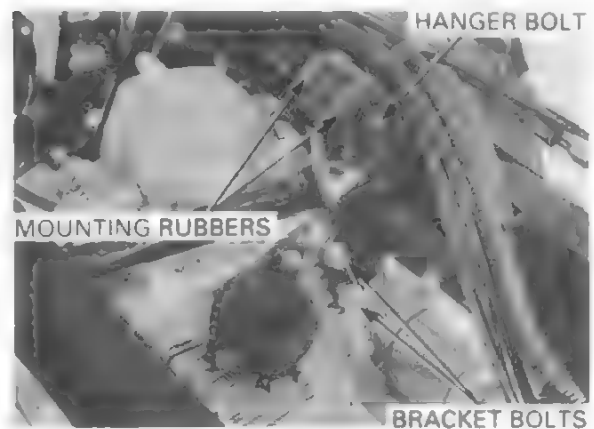
TRX450S/FM Remove the gearshift pedal.



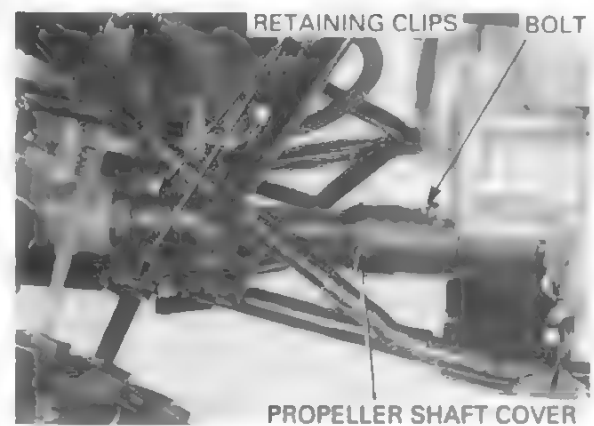
Loosen the swingarm boot band screw.



Remove the upper engine hanger bolt.  
Remove the hanger bracket bolts, upper hanger plate and mounting rubbers and bracket.

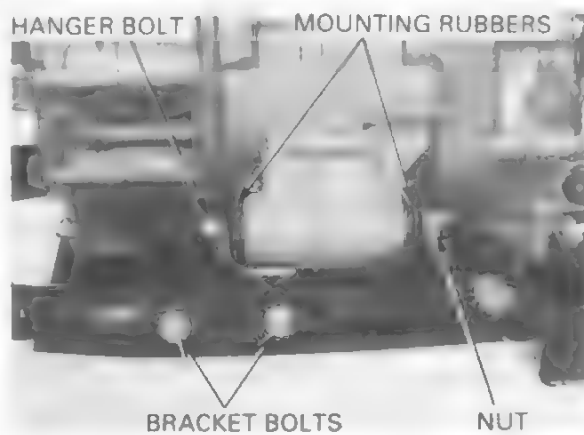


'98 - '01: Remove the bolt and two retaining clips and propeller shaft cover.



Remove the left lower engine hanger bolt/nut, collar and engine mounting rubbers.

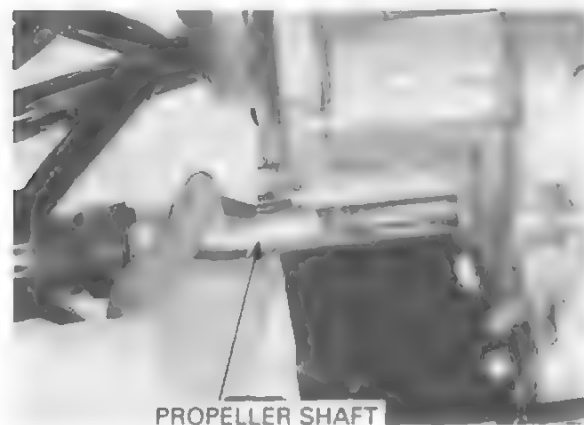
Remove the bolts and left lower engine hanger bracket.



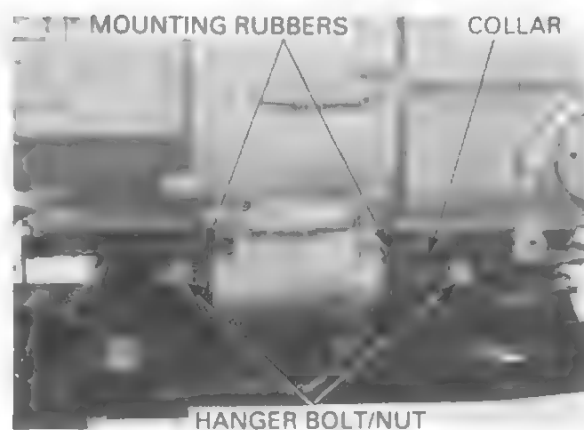
Remove the rear mounting bolt.



Move the front differential forward.  
Remove the front propeller shaft.



Remove the right lower engine hanger bolt/nut, collar and engine mounting rubbers.



## ENGINE REMOVAL/INSTALLATION

Remove the following:

- Front differential mounting bolt and nut
- Front differential mounting bracket bolts and bracket
- Upper mounting bolt, nut and collar

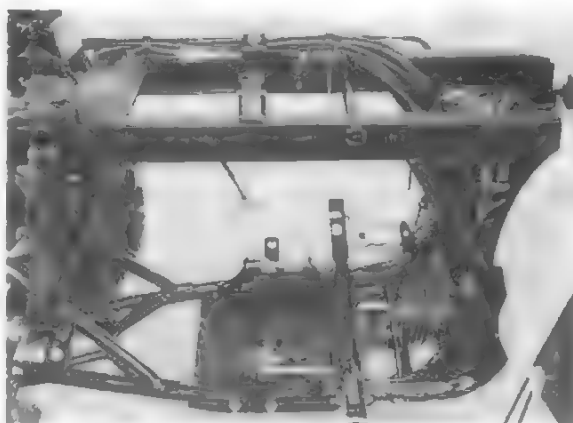
UPPER MOUNTING BOLT/NUT/COLLAR



*Be careful not damage the control motor upon engine removal and installation (TRX450ES)*

Move the engine forward, then disconnect the yoke joint from the final shaft.

Remove the engine from the left side of the frame.

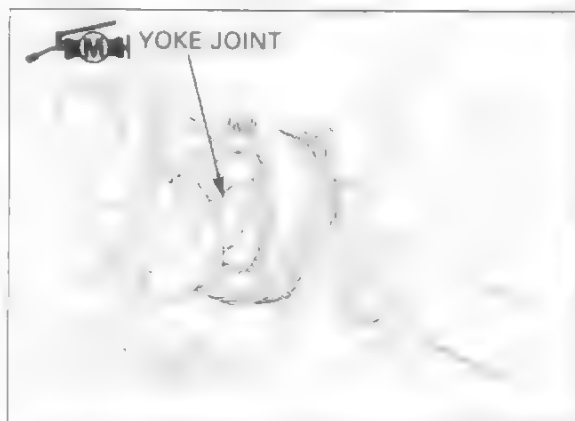


## ENGINE INSTALLATION

Apply molybdenum disulfide grease to the yoke joint splines.

Install the engine from the left side.

Move the engine rearward and connect the final shaft and yoke joint.



*When installing the engine, loosely install all of the engine hanger and bracket bolts. Then tighten the bolts to the specified torque as show bellow*

Install the mounting rubbers and lower left engine hanger bracket.

Install the bracket bolts.

Install the lower left engine hanger bolts and nut.

### NOTE:

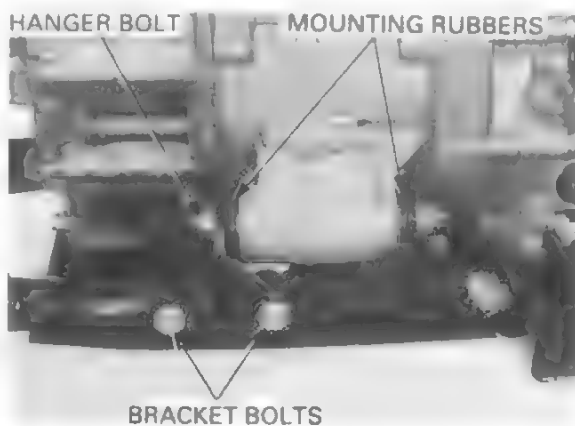
Install the mounting rubbers with the wide side towards the engine.

First tighten the engine hanger bolt to the specified torque.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Tighten the lower hanger bracket bolts to the specified torque.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**



Install and tighten the lower right engine hanger mounting rubbers, collar and hanger bolt/nut to the specified torque.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**



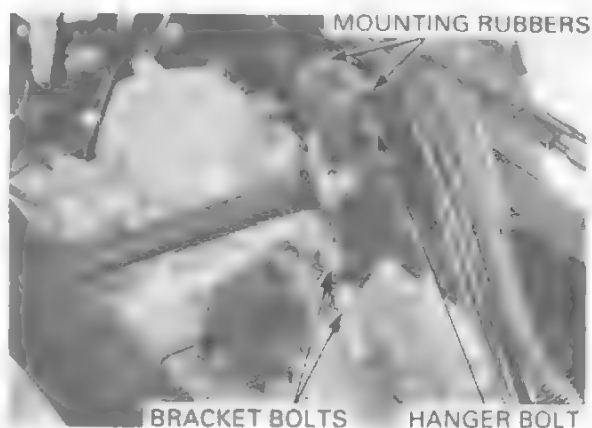
Install the upper hanger plate, engine hanger bracket, bracket bolts, mounting rubbers and hanger bolt.

First tighten the hanger bracket bolts to the specified torque.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

Tighten the upper engine hanger bolt to the specified torque.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**



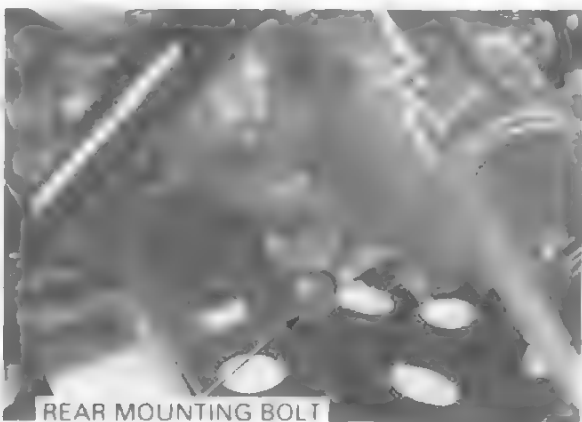
Apply molybdenum disulfide grease to the propeller shaft splines.  
Install the front propeller shaft.

Connect the propeller shaft to the engine over the O-ring while pulling back the propeller shaft joint. Rotate the shaft slightly if necessary to align the splines.



Tighten the rear mounting bolt to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



## ENGINE REMOVAL/INSTALLATION

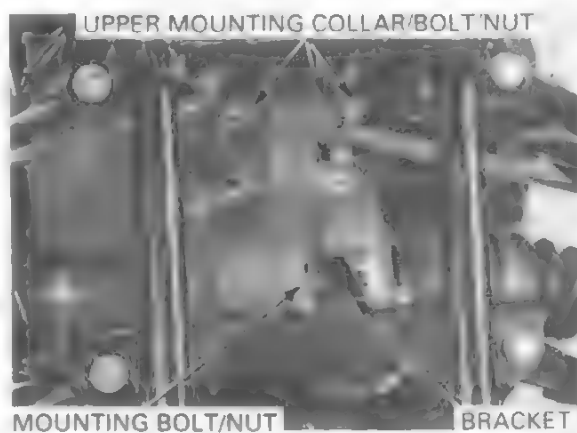
Install the upper mounting bolts with the upper mounting collar and nut in the location as shown.

Tighten the upper mounting nut to the specified torque.

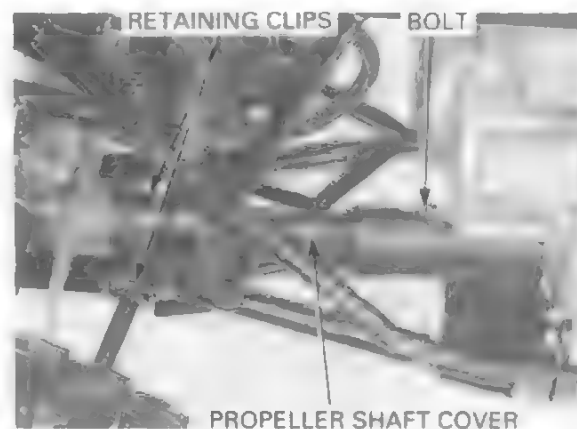
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the front mounting bracket and mounting bolt then tighten the bolts and nut to the specified torque.

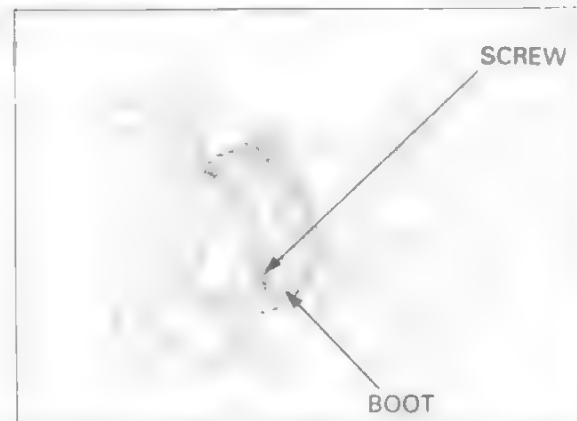
**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**



- '98 - '01: Install the propeller shaft cover. Install the retaining clips and mounting bolt, then tighten the bolt securely.



Set the swingarm boot on the rear crankcase cover properly and tighten the screw.

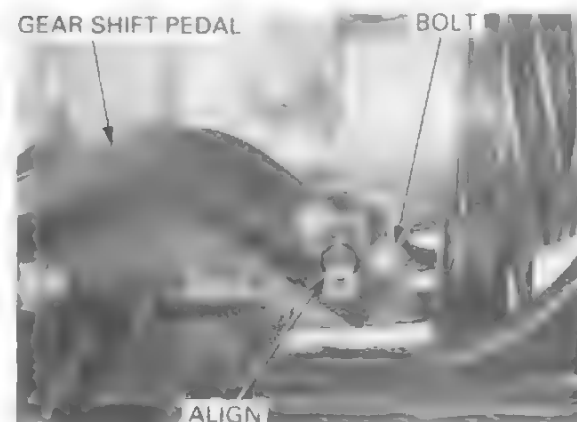


- TAX450S FM* Install the gearshift pedal on to the gearshift spindle by aligning the punch marks.

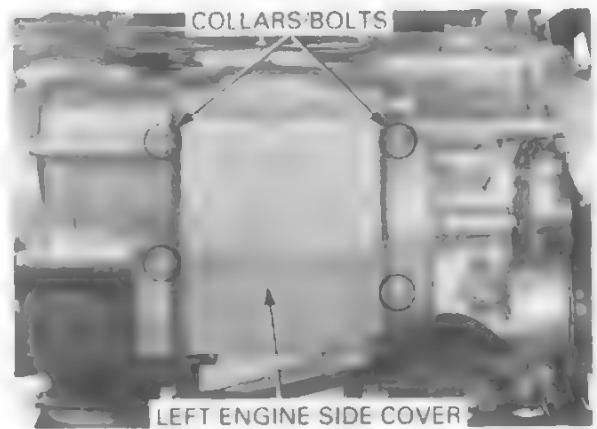


Tighten the bolt to the specified torque.

**TORQUE: '98 - '01: 16 N·m (1.6 kgf·m, 12 lbf·ft)**  
**After '01: 20 N·m (2.0 kgf·m, 14 lbf·ft)**

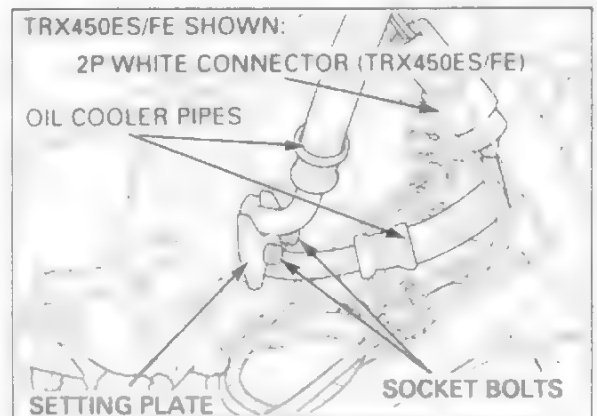


Install the left engine side cover and collars, then tighten the bolts.



Connect the oil cooler pipes using new O-rings. Install the setting plate and tighten the socket bolts.

**TRX450ES/FE:** Connect the control motor connector (2P White).



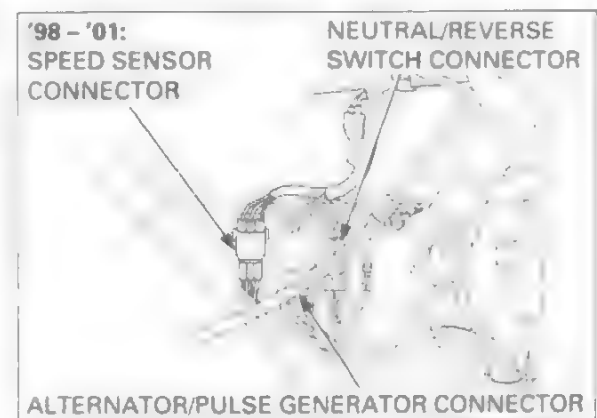
Route the alternator, ignition pulse generator, neutral reverse switch and oil thermo sensor wire properly (page 1-28) and clamp them securely.

Connect the reverse control cable end to the reverse selector lever and hook the cable to the cable guide. Connect the thermo sensor wire connector.



**TRX450S/FM:** Connect the alternator, ignition pulse generator and neutral/reverse switch connectors.

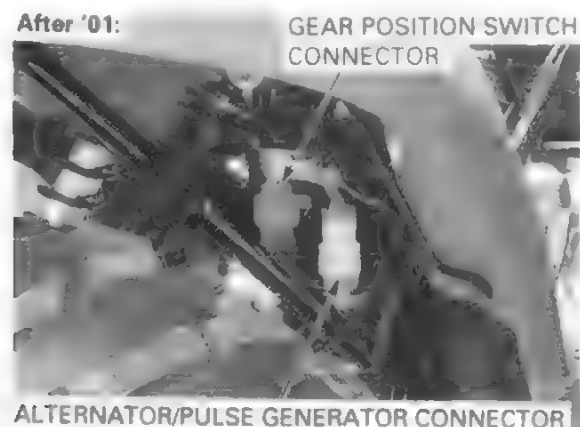
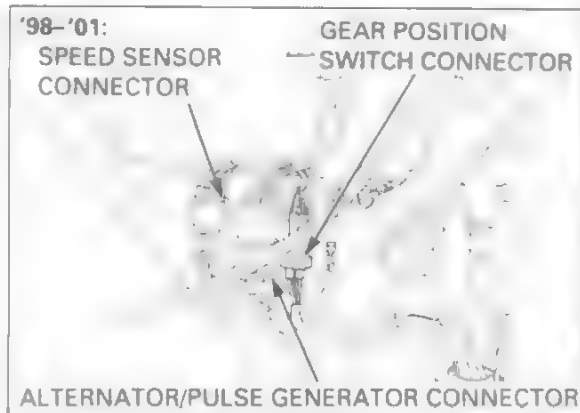
**98 - '01:** Connect the speed sensor connector and set the connector bracket to the flame stay.



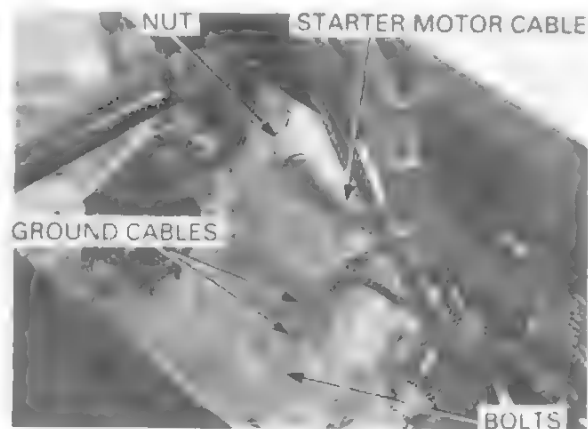
## ENGINE REMOVAL/INSTALLATION

**TRX450ES/FE:** Connect the alternator, ignition pulse generator and gear position switch connectors.

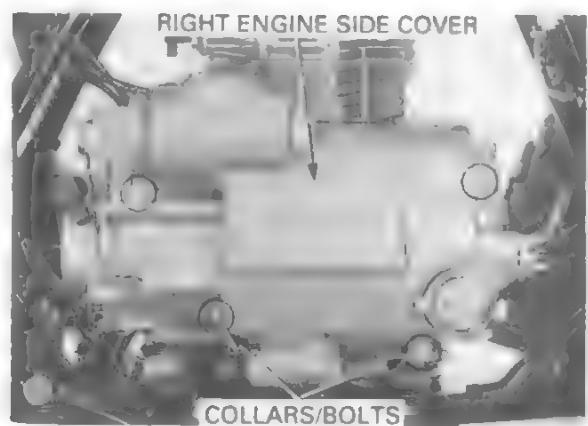
**'98 - '01:** Connect the speed sensor connector and set the connector bracket to the frame stay.



Connect the engine ground cable terminals and tighten the bolts.  
Connect the starter motor cable and tighten the nuts.



Install the right engine side cover and tighten the bolts.



Install the spark plug cap.

Install the carburetor (page 5-16).

Install the removed parts in the reverse order of removal.

Fill the crankcase with recommended engine oil (page 3-10).

Fill the front differential with recommended gear oil (page 3-13).

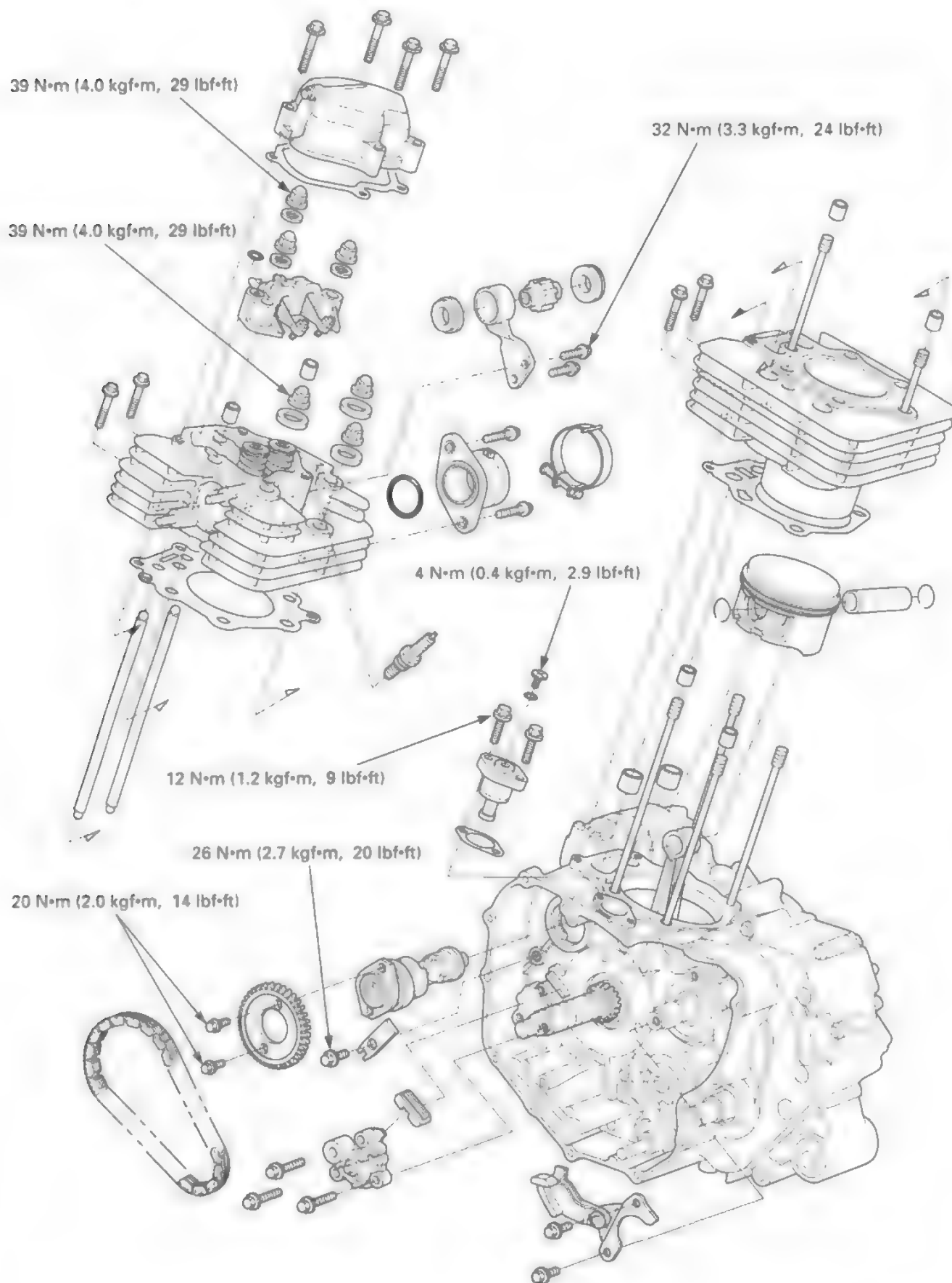
Perform the following inspection and adjustment:

- Throttle operation (page 3-4)
- Reverse selector cable adjustment (page 3-18)





## CYLINDER HEAD/CYLINDER/PISTON



# 7. CYLINDER HEAD/CYLINDER/PISTON

SERVICE INFORMATION	7-1	CYLINDER HEAD ASSEMBLY	7-13
TROUBLESHOOTING	7-3	CYLINDER HEAD INSTALLATION	7-14
CYLINDER COMPRESSION TEST	7-4	CYLINDER/PISTON REMOVAL	7-16
CYLINDER HEAD REMOVAL	7-4	CYLINDER/PISTON INSPECTION	7-17
CYLINDER HEAD DISASSEMBLY	7-7	CYLINDER/PISTON INSTALLATION	7-20
CYLINDER HEAD INSPECTION	7-7	CAMSHAFT/CAM CHAIN TENSIONER	7-22

## SERVICE INFORMATION

### GENERAL

- This section covers service of the cylinder head, cylinder and piston. These services can be done with the engine installed in the frame.
- Camshaft servicing require front crankcase cover removal (section 8).
- When disassembling, mark and store the disassembled parts to ensure that they are reinstalled in their original locations.
- Clean all disassembled parts with cleaning solvent and dry them by blowing them off with compressed air before inspection.
- Rocker arm lubricating oil is fed through oil passages in the cylinder head and head cover. Clean the oil passages before assembling cylinder head.
- Be careful not to damage the mating surface when removing the cylinder cover, cylinder head and cylinder.

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARDS	SERVICE LIMIT
Cylinder compression	Decompressor effected		539 – 834 kPa (5.5 – 8.5 kgf/cm <sup>2</sup> , 78 – 121 psi) at 450 rpm	—
	Decompressor not effected		1,226 – 1,442 kPa (12.5 – 14.5 kgf/cm <sup>2</sup> , 178 – 206 psi) at 450 rpm	—
Valve, valve guide	Valve clearance	IN	0.15 (0.006)	—
		EX	0.15 (0.006)	—
	Valve stem O.D.	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.45 (0.215)
		EX	5.455 – 5.470 (0.2148 – 0.2154)	5.43 (0.214)
	Valve guide I.D.	IN	5.500 – 5.512 (0.2165 – 0.2170)	5.525 (0.2175)
		EX	5.500 – 5.512 (0.2165 – 0.2170)	5.525 (0.2175)
	Stem to guide clearance	IN	0.010 – 0.037 (0.0004 – 0.0015)	0.12 (0.005)
		EX	0.030 – 0.057 (0.0012 – 0.0022)	0.14 (0.006)
	Valve seat width		1.2 (0.005)	1.5 (0.06)
Valve spring free length	Inner		36.85 (1.451)	35.84 (1.411)
	Outer		41.67 (1.641)	40.42 (1.591)
Rocker arm/shaft	Rocker arm I.D.		12.000 – 12.018 (0.4724 – 0.4731)	12.05 (0.474)
	Rocker arm shaft O.D.		11.964 – 11.984 (0.4710 – 0.4718)	11.92 (0.469)
	Rocker arm to shaft clearance		0.016 – 0.054 (0.0006 – 0.0021)	0.08 (0.003)

## CYLINDER HEAD/CYLINDER/PISTON

Unit: mm (in)

Unit: mm (in)

ITEM			STANDARDS	SERVICE LIMIT
Camshaft and cam follower	Cam lobe height	IN	36.4291 – 36.5891 (1.43421 – 1.44039)	36.25 (1.427)
		EX	36.2670 – 36.4270 (1.42783 – 1.43131)	36.10 (1.421)
	Cam follower O.D.	IN/EX	22.467 – 22.482 (0.8845 – 0.8851)	22.46 (0.884)
	Cam follower bore I.D.	IN/EX	22.510 – 22.526 (0.8862 – 0.8868)	22.54 (0.887)
	Cam follower to bore clearance		0.028 – 0.059 (0.0011 – 0.0023)	0.07 (0.003)
Cylinder	I.D.		90.00 – 90.01 (3.543 – 3.544)	90.10 (3.547)
	Taper		_____	0.10 (0.004)
	Out of round		_____	0.10 (0.004)
	Warpage		_____	0.10 (0.004)
Piston, piston rings, piston pin	Piston mark direction		"IN" mark facing toward the intake side	_____
	Piston O.D.		89.945 – 89.965 (3.5411 – 3.5419)	89.90 (3.539)
	Piston O.D. measurement point		10 mm (0.4 in) from bottom of skirt	_____
	Piston pin bore I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.08 (0.751)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	Piston-to piston pin clearance		0.002 – 0.014 (0.0001 – 0.0006)	0.12 (0.039)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0011 – 0.0024)	0.09 (0.004)
		Second	0.015 – 0.45 (0.0006 – 0.0018)	0.09 (0.004)
	Piston ring end gap	Top	0.015 – 0.30 (0.0006 – 0.012)	0.5 (0.02)
		Second	0.300 – 0.450 (0.012 – 0.018)	0.6 (0.02)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	_____
Cylinder-to-piston clearance			0.035 – 0.056 (0.0014 – 0.0022)	0.10 (0.004)
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.7508)
Connecting rod-to-piston pin clearance			0.020 – 0.047 (0.0008 – 0.0019)	0.10 (0.004)

## TORQUE VALUES

Cylinder head flange cap nut	39 N•m (4.0 kgf•m, 29 lbf•ft)	Apply oil to threads and flange surface
Rocker arm holder flange cap nut	39 N•m (4.0 kgf•m, 29 lbf•ft)	Apply oil to threads and flange surface
Rocker arm shaft flange bolt	7 N•m (0.7 kgf•m, 5.1 lbf•ft)	Apply oil to threads and flange surface
Cam chain tensioner lifter sealing screw	4 N•m (0.4 kgf•m, 2.9 lbf•ft)	
Cam chain tensioner mounting bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)	Apply a locking agent
Cam sprocket flange dowel bolt	20 N•m (2.0 kgf•m, 14 lbf•ft)	Apply a locking agent
Camshaft bearing retainer bolt	26 N•m (2.7 kgf•m, 20 lbf•ft)	Apply a locking agent
Upper engine hanger bolt	54 N•m (5.5 kgf•m, 40 lbf•ft)	
Upper engine hanger bracket bolt	32 N•m (3.3 kgf•m, 24 lbf•ft)	

## TOOLS

Valve guide drive, 5.5 mm	07742-0010100
Valve guide reamer, 5.5 mm	07984-2000001 or 07984-200000D (U.S.A. only)
Valve spring compressor	07757-0010000
Valve set cutters	– these are commercially available in U.S.A.
Seat cutter, 35 mm (45° IN)	07780-0010400
Seat cutter, 29 mm (45° EX)	07780-0010300
Flat cutter, 35 mm (32° IN)	07780-0012300
Flat cutter, 30 mm (32° EX)	07780-0012200
Interior cutter, 37.5 mm (60° IN)	07780-0014100
Interior cutter, 30 mm (60° EX)	07780-0014000
Cutter holder, 5.5 mm	07781-0010101

## TROUBLESHOOTING

- Engine top-end problems usually affect engine performance. These problem can be diagnosed by a compression test or by tracing engine noises to the top-end with a sounding rod stethoscope.
- If the performance is poor at low speeds, check for white smoke in the crankcase breather tube. If the tube is smoky, check for a seized piston ring.

### Low compression

- Valves:
  - Incorrect valve adjustment
  - Burned or bent valve
  - Incorrect valve timing
  - Weak valve spring
- Cylinder head:
  - Leaking or damaged head gasket
  - Warped or cracked cylinder head
- Cylinder/piston
  - Worn cylinder or piston ring

### High compression

- Excessive carbon build-up on piston crown or combustion chamber

### Excessive smoke

- Worn valve stem or valve guide
- Damaged stem seal
- Worn cylinder, piston or piston rings
- Improper installation of piston rings
- Scored or scratched piston or cylinder wall

### Excessive noise

- Incorrect valve adjustment
- Sticking valve or broken valve spring
- Worn or damaged push rod and/or cam follower
- Worn rocker arm and/or shaft

### Rough idle

- Low cylinder compression
- Intake air leak

### Overheating

- Excessive carbon build-up on the piston head or on combustion chamber

### Knocking or abnormal noise

- Worn piston and cylinder
- Excessive carbon build-up

### CYLINDER COMPRESSION TEST

#### **⚠ WARNING**

*If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in enclosed area.*

Warm up the engine.  
Stop the engine and remove the spark plug.  
Install a compression gauge.  
Open the throttle all the way and crank the engine with the starter motor until the gauge reading stops rising.

#### **Compression pressure:**

539 – 834 kPa (5.5 – 8.5 kgf/cm<sup>2</sup>, 78 – 121 psi)  
at 450 rpm

If compression is below than the standard, loosen the exhaust valve lock nut and turn the adjusting screw 1-1/2 turn and recheck the compression.

#### **Compression pressure:**

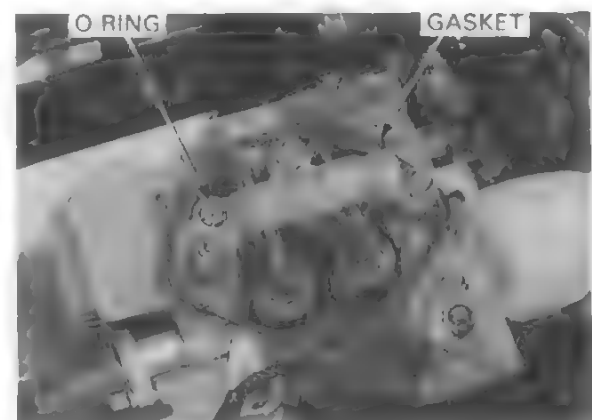
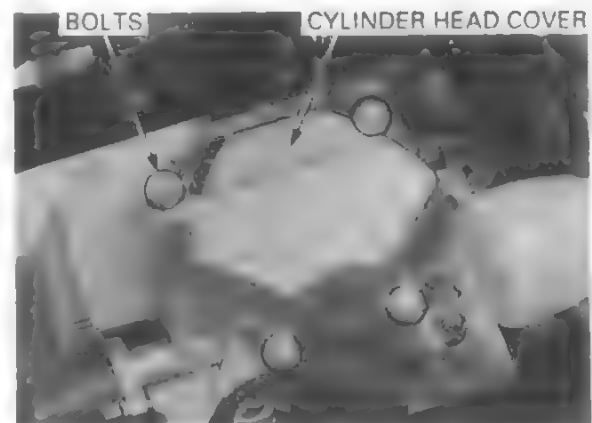
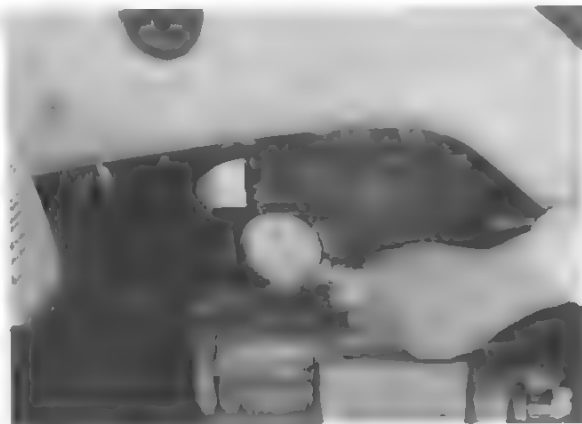
1,226 – 1,442 kPa (12.5 – 14.5 kgf/cm<sup>2</sup>,  
178 – 206 psi) at 450 rpm

Low compression can be caused by:

- Blown cylinder head gasket
- Improper valve adjustment
- Valve leakage
- Worn piston ring or cylinder

High compression can be caused by:

- Carbon deposits in combustion chamber or on piston head



### CYLINDER HEAD REMOVAL

#### **CYLINDER HEAD COVER REMOVAL**

Remove the fuel tank and fuel tank heat guard (page 5-20).

Remove the bolts and cylinder head cover.

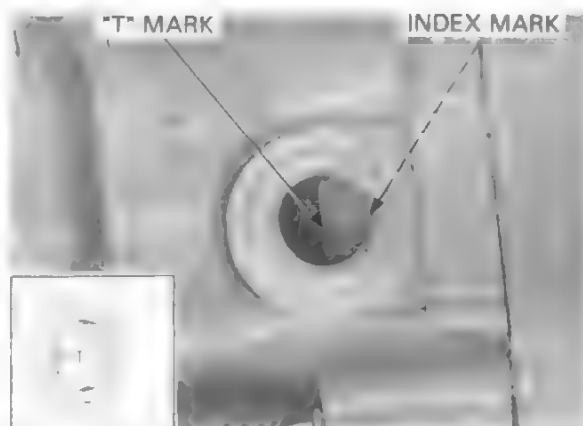
Remove the O-ring and cylinder head cover gasket.

**CYLINDER HEAD REMOVAL**

Remove the timing hole cap.

Turn the crankshaft with the recoil starter and align the "T" mark on the flywheel with the index mark on the rear crankcase cover.

Make sure the piston is at TDC of the compression stroke by moving the rocker arms. If the rocker arms are tight, turn the crankshaft one full turn and realign the "T" mark with the index mark.

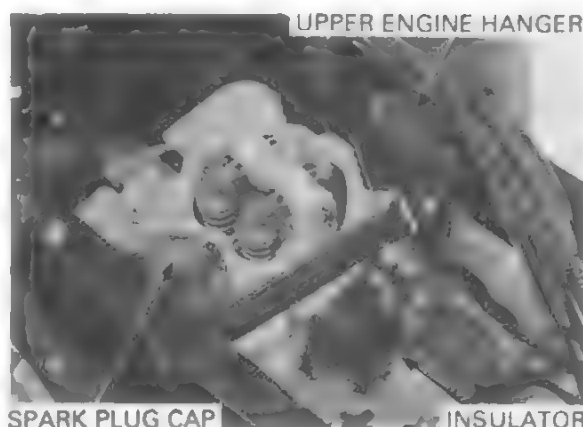


Remove the following:

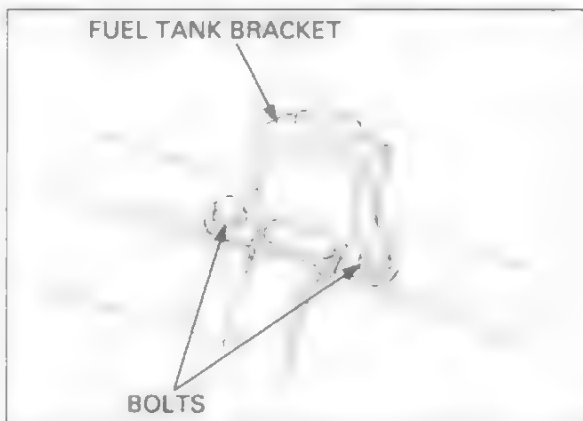
- Exhaust pipe (page 2-15)
- Carburetor (page 5-5)
- Spark plug cap

Remove the bolts and carburetor insulator.

Remove the upper engine hanger bolts, bracket bolts and engine hanger.



Remove the left fuel tank bracket mounting bolts and bracket.



Remove the 6 mm cylinder head mounting bolts.

Loosen the six cylinder head cap nuts in a crisscross pattern in 2 or 3 steps.

Remove the washers.

Remove the rocker arm holder assembly.



## CYLINDER HEAD/CYLINDER/PISTON

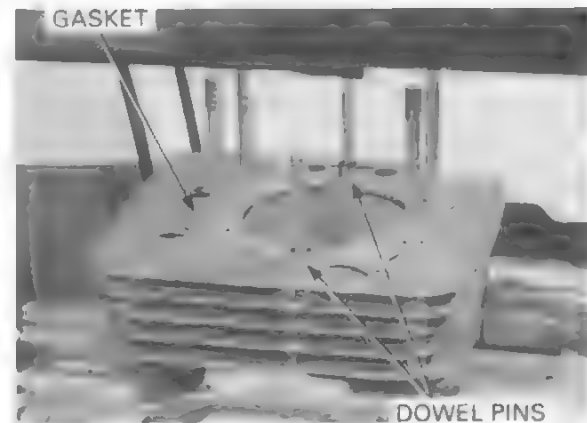
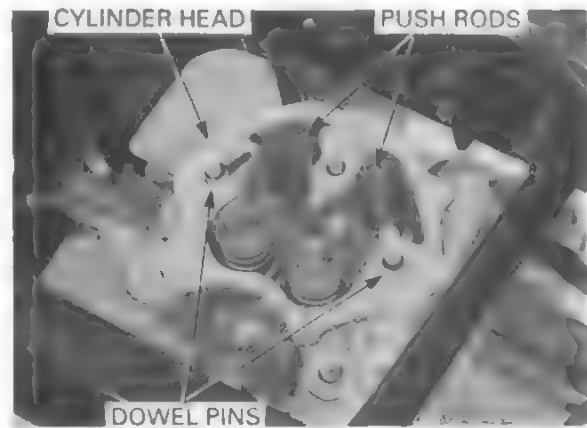
Remove the dowel pins.  
Mark the push rods so they can be reinstalled in their original position.  
Remove the push rods.

### CAUTION:

*Do not disassemble the push rods, if you do, replace the push rods necessary.*

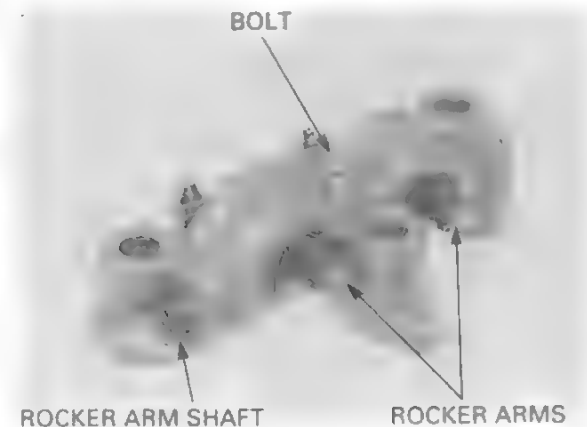
Remove the cylinder head.

Remove the gasket and dowel pins.



## ROCKER ARM HOLDER DISASSEMBLY

Remove the rocker arm shaft retaining bolt.  
Mark the rocker arms so they can be reinstalled in their original positions.  
Remove the rocker arm shaft and rocker arms.



## ROCKER ARM HOLDER INSPECTION

Inspect the rocker arms and shaft for wear or damage.

Measure the I.D. of each rocker arm.

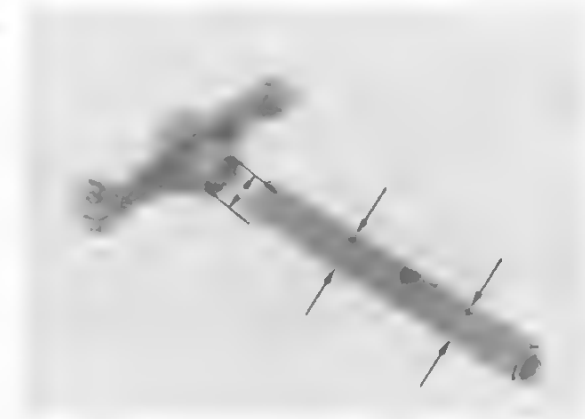
**SERVICE LIMIT: 12.05 mm (0.474 in)**

Measure the O.D. of rocker arm shaft.

**SERVICE LIMIT: 11.92 mm (0.469 in)**

Calculate the rocker arm-to-shaft clearance.

**SERVICE LIMIT: 0.08 mm (0.003 in)**



## CYLINDER HEAD DISASSEMBLY

Mark all parts during disassembly so they can be placed back in their original locations.

Remove the valve spring cotters, retainers, springs and valve using the special tool as shown.

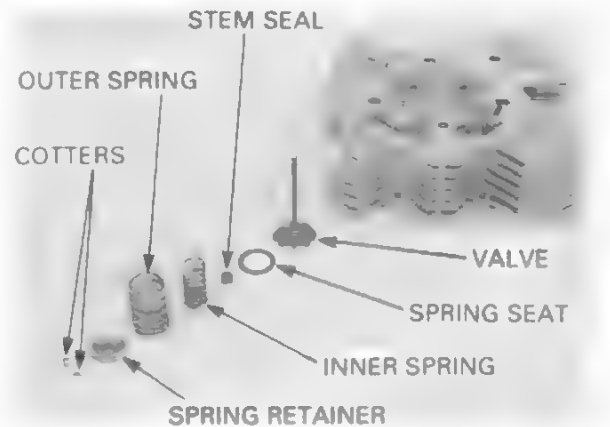
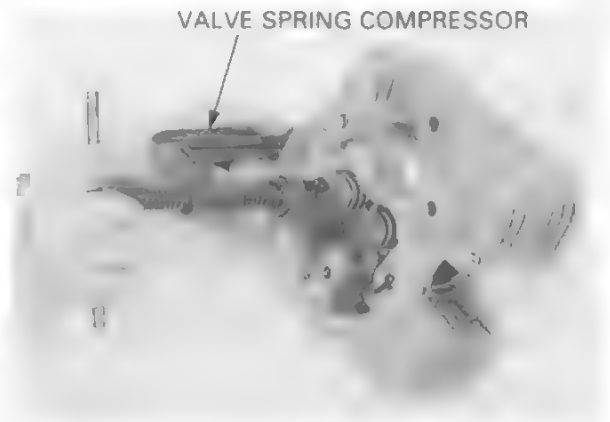
### TOOL:

Valve spring compressor 07757-0010000

### CAUTION:

To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.

Remove the valve stem seals and valve spring seats.



## CYLINDER HEAD INSPECTION

### CYLINDER HEAD

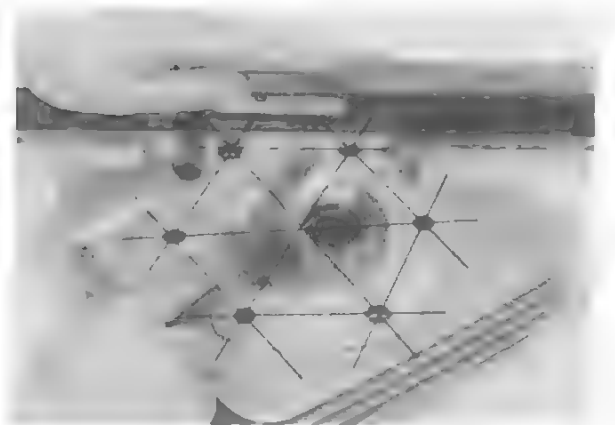
Avoid damaging the gasket surface.

Remove carbon deposits from the combustion chamber.

Check the spark plug hole and valve areas for cracks.

Check the cylinder head for warpage with a straight edge and feeler gauge.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



### VALVE SPRING

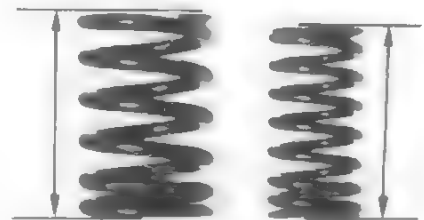
Measure the free length of the inner and outer valve springs.

**SERVICE LIMITS: mm**

Inner: 35.84 mm (1.411 in)

Outer: 40.42 mm (1.591 in)

Replace the springs if they are shorter than the service limits.





### VALVE/VALVE GUIDE

Inspect each valve for bending, burning or abnormal stem wear.

Check valve movement in the guide, measure and record each valve stem O.D.

#### SERVICE LIMITS:

IN: 5.45 mm (0.215 in)

EX: 5.43 mm (0.214 in)



Ream the guides to remove any carbon deposits before checking clearances.

Insert the reamer from the rocker arm side of the head and always rotate the reamer clockwise.

#### TOOL:

Valve guide reamer,  
5.5 mm

07984-2000001 or  
07984-200000D  
(U.S.A. only)



Measure and record each valve guide I.D.

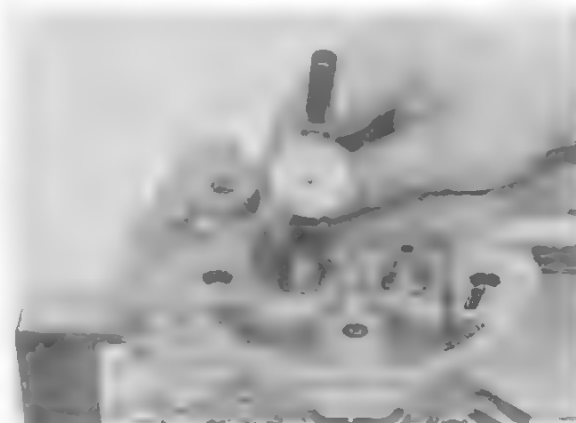
SERVICE LIMIT: IN/EX: 5.525 mm (0.2175 in)

Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the stem-to-guide clearance.

#### SERVICE LIMITS:

IN: 0.12 mm (0.005 in)

EX: 0.14 mm (0.006 in)



VALVE GUIDE REAMER



*Reface the valve seats whenever the valve guides are replaced (page 7-9).*

If the stem-to-guide clearance exceeds the service limits, determine if a new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guides as necessary and ream to fit.

If the stem-to-guide clearance exceeds the service limits with new guides also, replace the valves and guides.

## VALVE GUIDE REPLACEMENT

Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.  
Heat the cylinder head to 100 – 150°C (212 – 302°F) with a hot plate or oven.

### **⚠ WARNING**

*To avoid burns, wear heavy gloves when handling the heated cylinder head.*

### **CAUTION:**

*Do not use a torch to heat the cylinder head; it may cause warping.*

Support the cylinder head and drive out the valve guides from combustion chamber side of the cylinder head using the special tool as shown.

### **TOOL:**

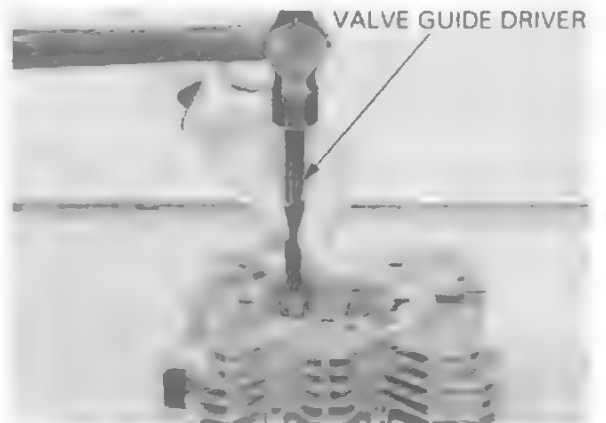
Valve guide driver, 07742-0010100  
5.5 mm



Replace a new O-ring on the new valve guide.  
Drive in the guide from the top of the head using the special tool as shown.

### **TOOL:**

Valve guide driver, 07742-0010100  
5.5 mm



Let the cylinder head cool to room temperature.

Ream the new valve guide after installation.  
Insert the reamer from the combustion chamber side of the head and also always rotate the reamer clockwise.

### **TOOL:**

Valve guide reamer, 07984-2000001 or  
5.5 mm 07984-200000D  
(U.S.A. only)



### **NOTE:**

Use cutting oil on the reamer during this operation.

Clean the cylinder head thoroughly to remove any metal particles.  
Reface the valve seat (page 7-10).

### VALVE SEAT INSPECTION/REFACING

Clean the intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to the valve seats. Tap the valves and seats using a rubber hose or other hand-lapping tool.



Remove and inspect the valves.

#### CAUTION:

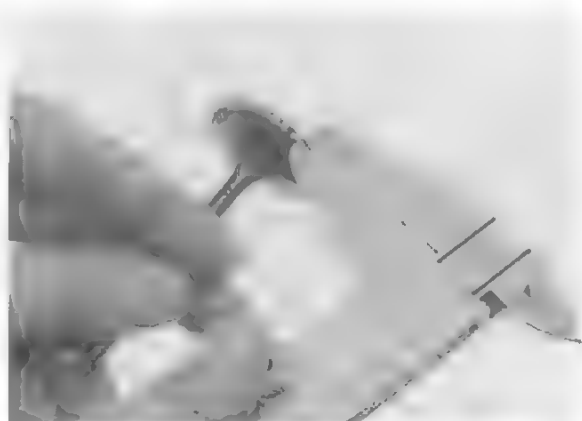
*The valves cannot be ground. If a valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.*

Inspect the width of each valve seat.

**STANDARD:** 1.2 mm (0.05 in)

**SERVICE LIMIT:** 1.5 mm (0.06 in)

If the seat is too wide, too narrow or has low spots, the seat must be ground.



### VALVE SEAT REFACING

#### NOTE:

- Follow the refacer manufacture's operating instruction.
- Reface the valve seat whenever the valve guide has been replaced.
- Be careful not to grind the seat more than necessary.

#### TOOLS:

Valve seat cutter, 35 mm (32° IN) 07780-0012300

Valve seat cutter, 30 mm (32° EX) 07780-0012200

Valve seat cutter, 35 mm (45° IN) 07780-0010400

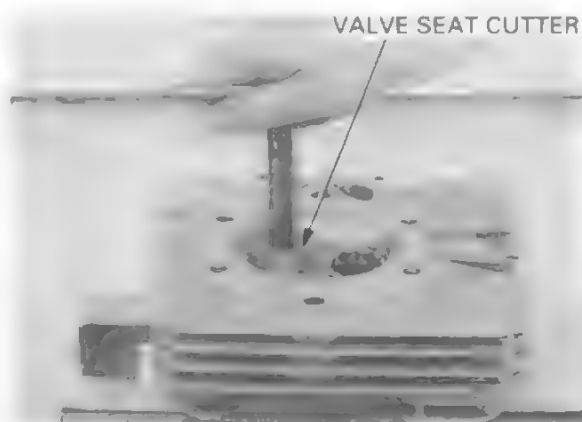
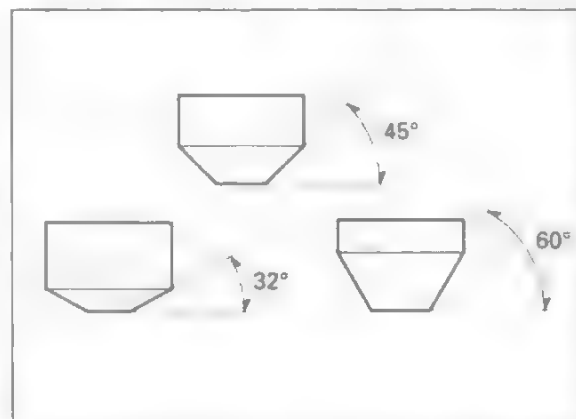
Valve seat cutter, 29 mm (45° EX) 07780-0010300

Valve seat cutter, 37.5 mm (60° IN) 07780-0014100

Valve seat cutter, 30 mm (60° EX) 07780-0014000

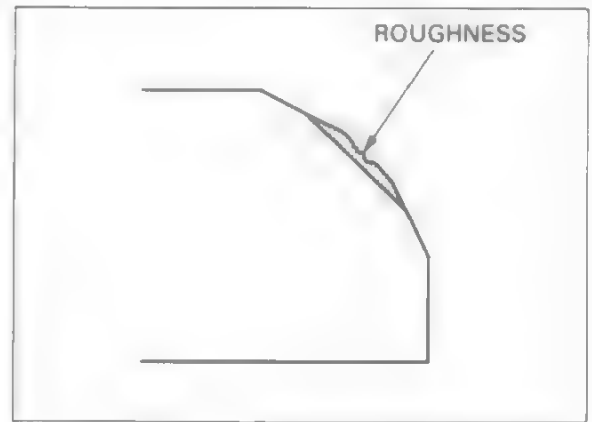
Valve seat cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.

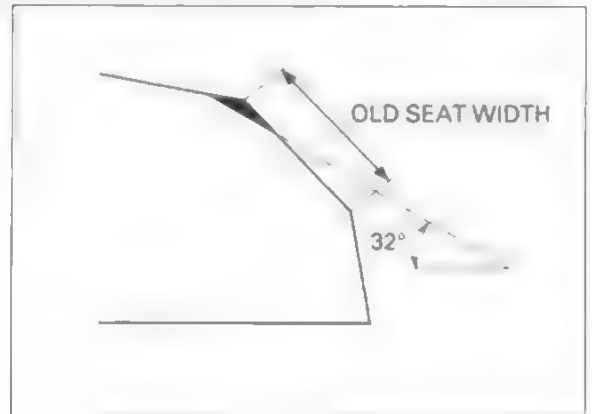


*Reface the seat with a 45-degree cutter whenever a valve guide is replaced.*

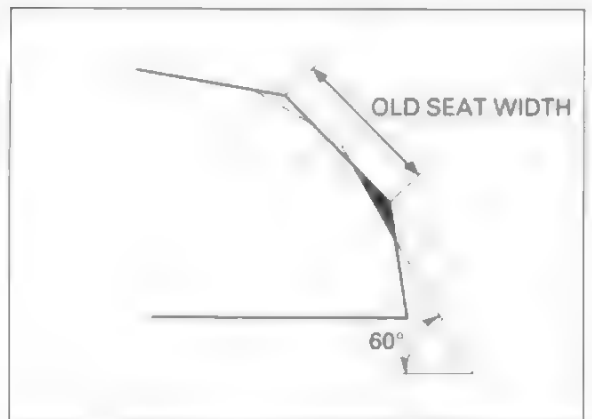
Use a 45-degree cutter to remove any roughness or irregularities from the seat.



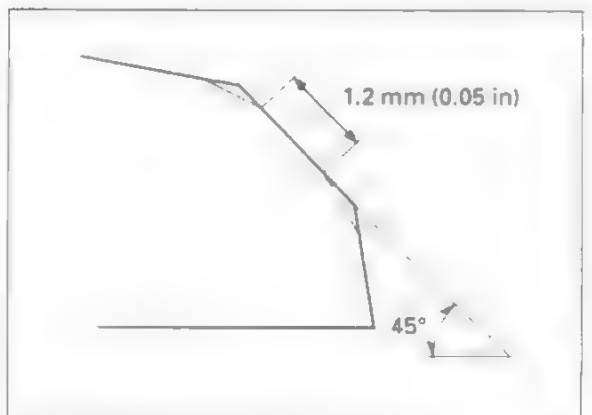
Use a 32-degree cutter to remove the top 1/4 of the existing valve seat material.



Use a 60-degree cutter to remove the bottom 1/4 of the old seat.  
Remove the cutter and inspect the area you have refaced.



Install a 45-degree finish cutter and cut the seat to the proper width.  
Make sure that all pitting and irregularities are removed.  
Refinish if necessary.



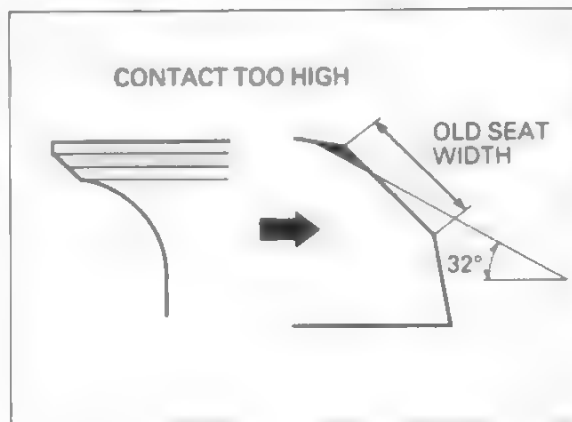
## CYLINDER HEAD/CYLINDER/PISTON

*The location of the valve seat in relation to the valve face is very important for good sealing.*

Apply a thin coating of Prussian Blue to the valve seat.

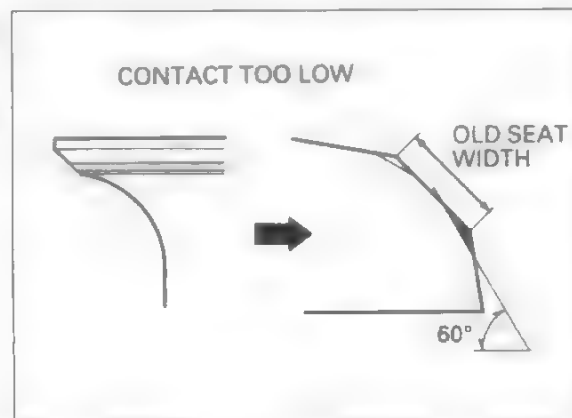
Press the valve through the valve guide and onto the seat to make a clear pattern.

If the contact area is too high on the valve, the seat must be lowered using a 32-degree flat cutter.



If the contact area is too low on the valve, the seat must be raised using a 60-degree inner cutter.

Refinish the seat to specifications, using a 45-degree finish cutter.



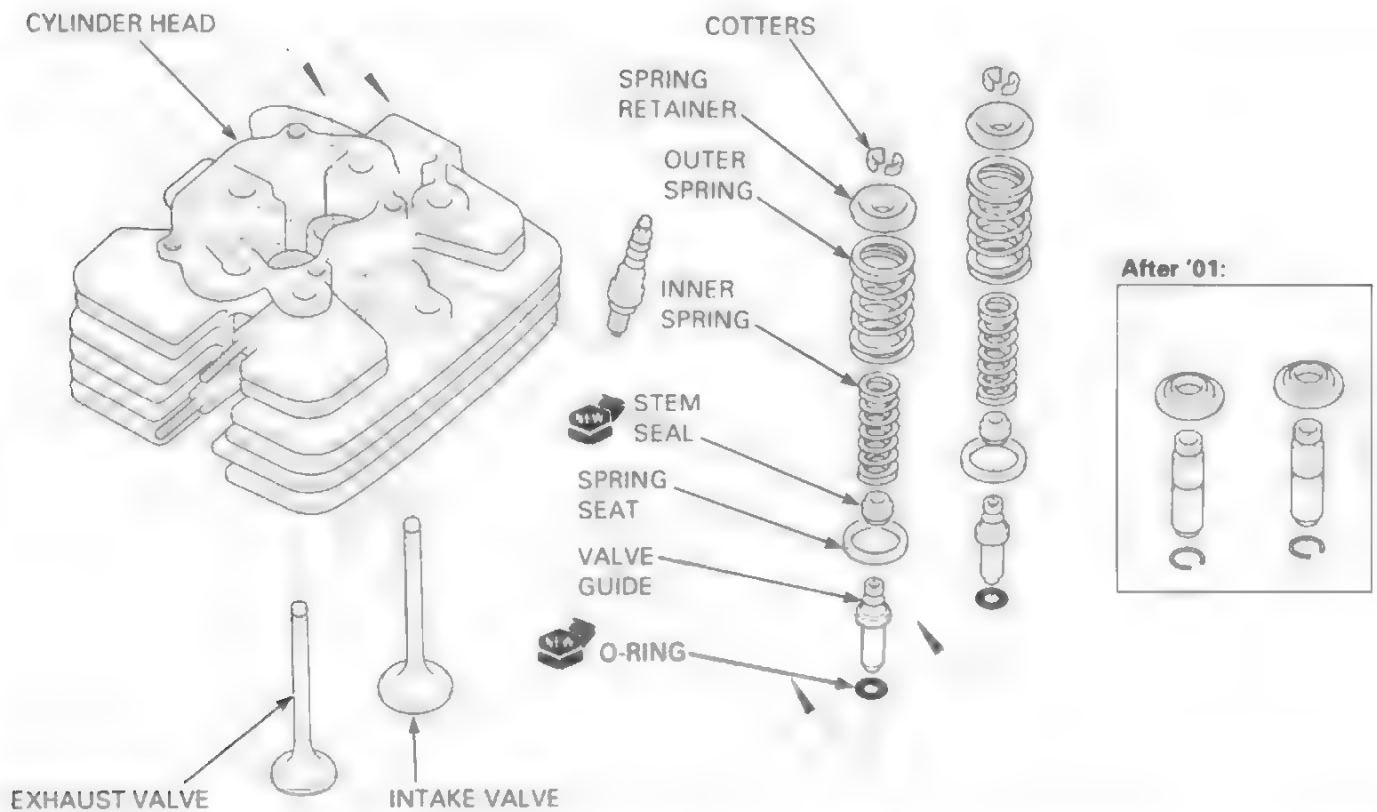
After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

*Do not allow lapping compound to enter the guides.*

After lapping, wash all residual compound off the cylinder head and valve.



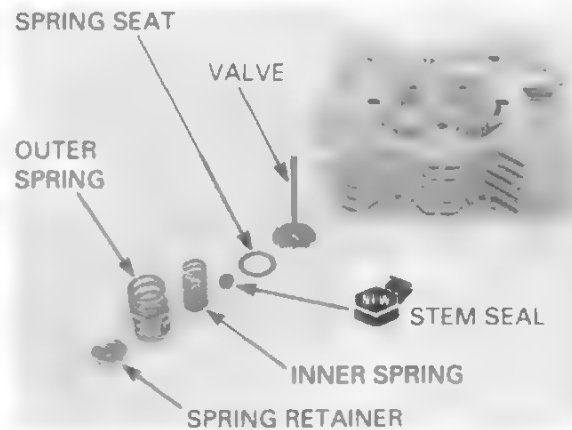
## CYLINDER HEAD ASSEMBLY



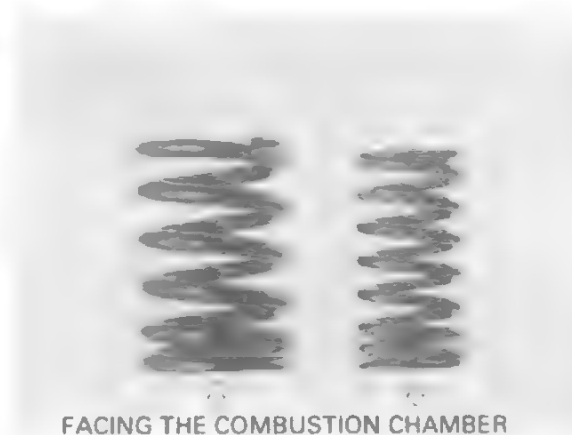
Clean the cylinder head assembly with solvent and blow through all oil passages with compressed air.

Install the valve spring seats.  
Install the new stem seals.

Lubricate the valve stems with engine oil and insert the valve into the valve guide.  
To avoid damage to the stem seal, turn the valve slowly when inserting.



Install the valve springs with the tightly wound coils facing the combustion chamber.  
Install the valve spring retainer.



## CYLINDER HEAD/CYLINDER/PISTON

Install the valve cotters using the special tool as shown.

**TOOL:**

Valve spring compressor 07757-0010000

**CAUTION:**

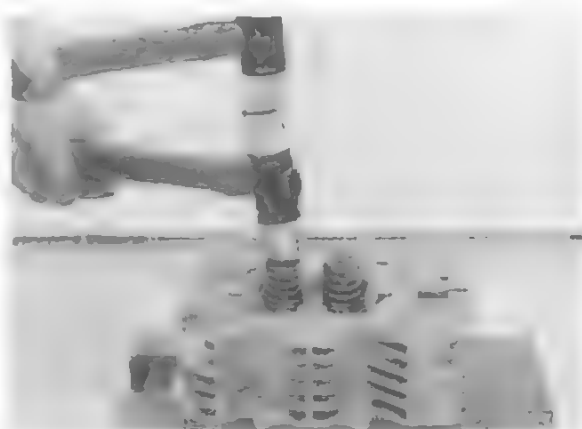
*To prevent loss of tension, do not compress the valve spring more than necessary.*

Tap the valve stems gently with two plastic hammers as shown to seat the cotters firmly.

**CAUTION:**

*Support the cylinder head above the work bench surface to prevent possible valve damage.*

### VALVE SPRING COMPRESSOR



## CYLINDER HEAD INSTALLATION

Install the dowel pins and a new cylinder head gasket as shown.

Install the cylinder head.

**NOTE:**

Do not install the gasket upside down. Install it as shown.

### ROCKER ARM HOLDER ASSEMBLY

Lubricate the rocker arm and rocker arm shaft with molybdenum disulfide oil.

Place the rocker arm into the rocker arm holder, then insert the rocker arm shaft.

**NOTE:**

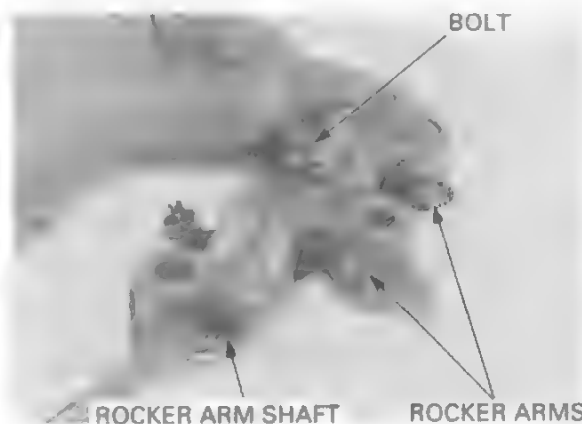
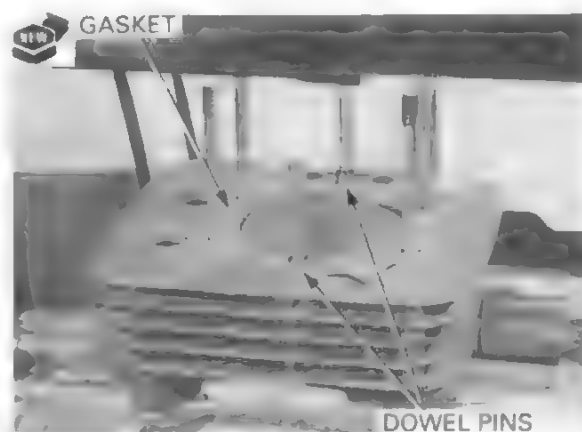
If reusing, install the rocker arms in their original locations as marked.

Turn the rocker arm shaft using a screwdriver to align the hole between the rocker arm holder and shaft.

Apply oil to the thread and flange surface of the rocker arm holder bolt.

Install and tighten the bolt to the specified torque.

**TORQUE: 7 N·m (0.7 kgf·m, 5.1 lbf·ft)**



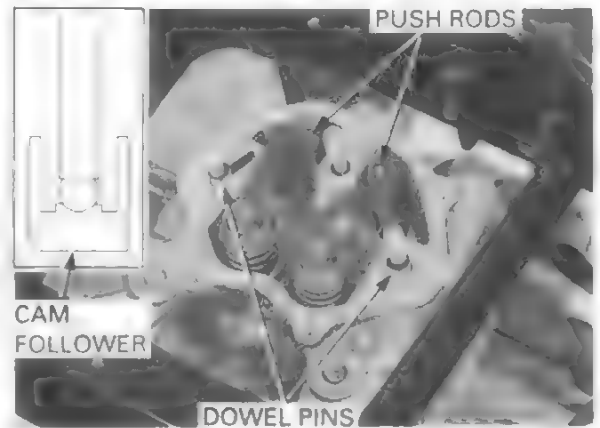
## ROCKER ARM HOLDER INSTALLATION

Properly install the push rods into the center groove of the cam follower.

### NOTE:

If reusing, install the push rods in their original locations as marked.

Install the two dowel pins.



Turn the crankshaft clockwise using the recoil starter knob, and align the "T" mark on the flywheel with the index mark on the rear crankcase cover. Make sure the piston is at TDC on the compression stroke.

If not, rotate the crankshaft 360° (1 full turn) and align the "T" mark with the index mark.

Install the rocker arm holder onto the cylinder head. Install the new washers and cap nuts.

Tighten the cap nut in a crisscross pattern in 2 – 3 steps.

**TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)**



Install and tighten the cylinder head mounting 6 mm bolts.

Install the upper engine hanger bracket, and tighten bracket bolts and the hanger bolt.

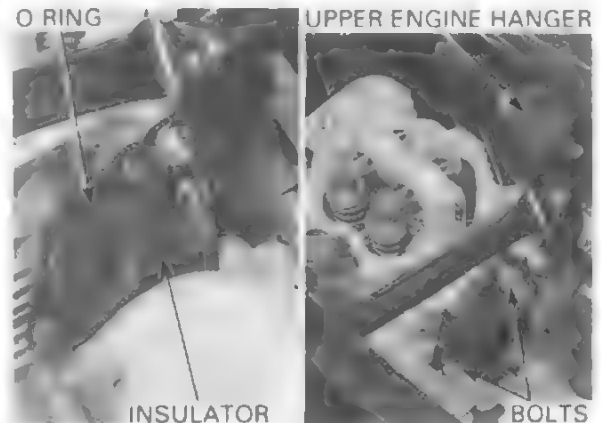
### TORQUE:

**Bracket bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

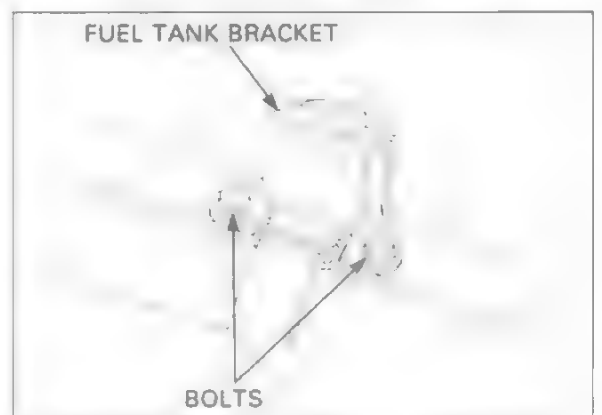
**Hanger bolt: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Check the O-ring is in good condition, install the carburetor insulator.

Tighten the insulator bolts.



Install the fuel tank bracket and tighten the bolts.

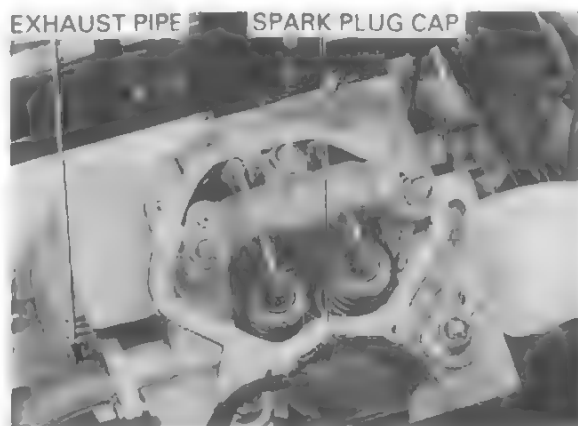




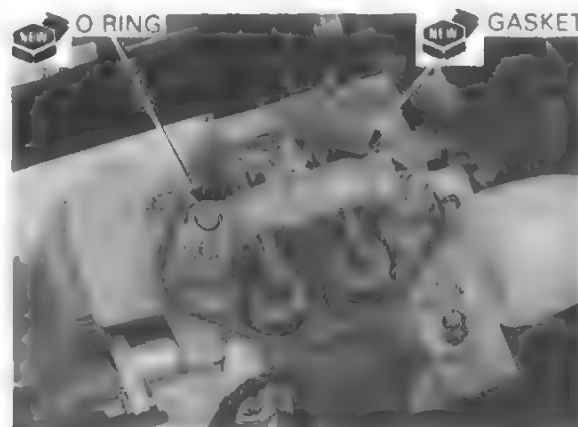
## CYLINDER HEAD/CYLINDER/PISTON

Install the following:

- Spark plug cap
- Carburetor (page 5-16)
- Exhaust pipe (page 2-16)

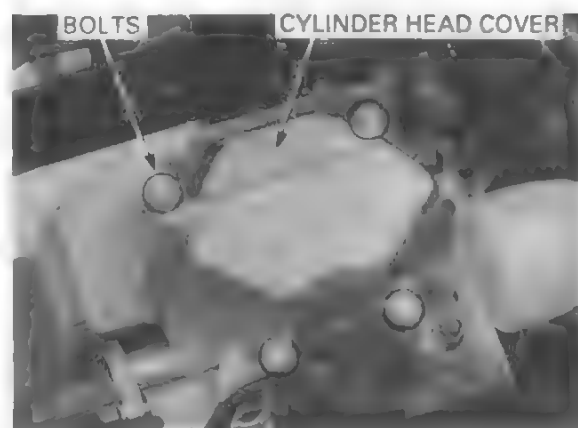


Install a new cylinder head cover gasket.  
Install a new O-ring into the groove of the rocker arm holder.



Install the cylinder head cover and tighten the bolts.

Install the fuel tank heat insulator and fuel tank (page 5-21).

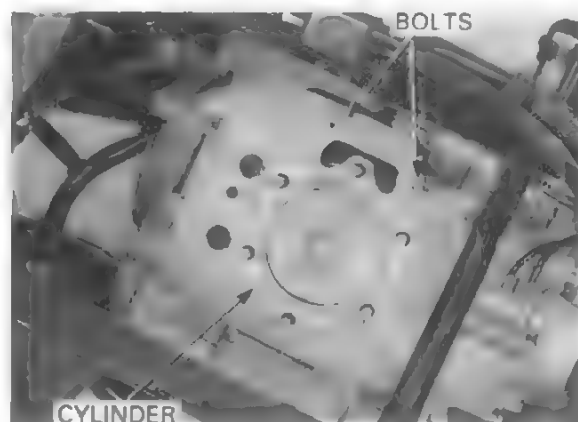


## CYLINDER/PISTON REMOVAL

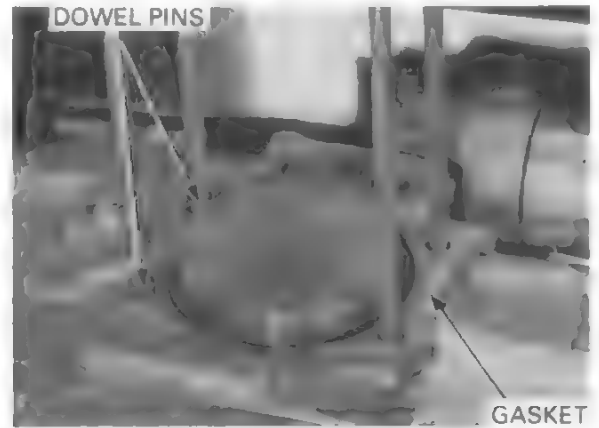
### CYLINDER REMOVAL

Remove the cylinder head (page 7-4).

Remove the cylinder bolts and cylinder.



Remove the cylinder gasket and dowel pins.

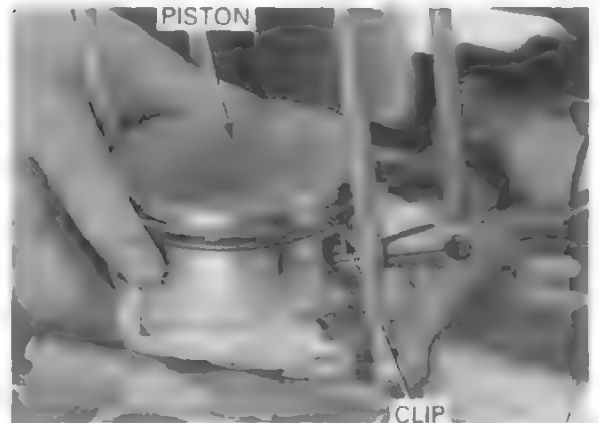


## PISTON REMOVAL

*Do not let the piston pin clips fall into the crankcase.*

Remove the piston pin clip with pliers.

Press the piston pin out of the piston and remove the piston.



## CYLINDER/PISTON INSPECTION

### CYLINDER

Inspect the cylinder bore for wear or damage. Measure the cylinder I.D. in X and Y axis at three levels.

Take the maximum reading to determine the cylinder wear.

**SERVICE LIMIT: 90.10 mm (3.547 in)**

Calculate the piston-to-cylinder clearance. Take a maximum reading to determine the clearance. Refer to page 7-19 for measurement of the piston O.D.

**SERVICE LIMIT: 0.10 mm (0.004 in)**

Calculate the taper and out of round at three levels in X and Y axis. Take the maximum reading to determine them.

#### SERVICE LIMITS:

**Taper: 0.10 mm (0.004 in)**

**Out of round: 0.10 mm (0.004 in)**

The cylinder must be rebored and an oversize piston fitted if the service limits are exceeded.

The following oversize pistons are available:

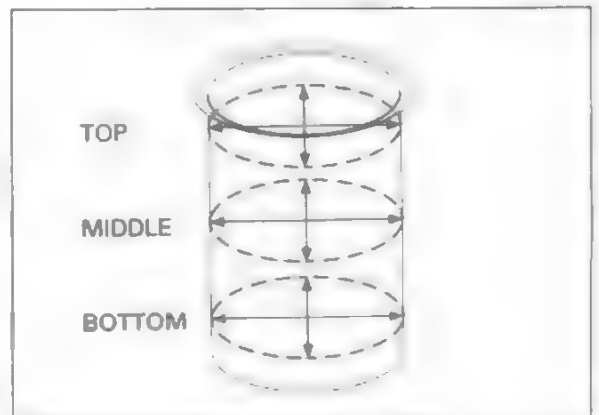
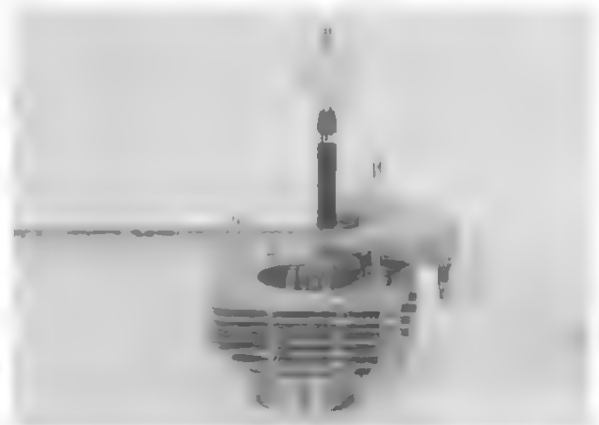
0.25 mm (0.010 in)

0.50 mm (0.020 in)

0.75 mm (0.030 in)

1.00 mm (0.039 in)

The piston to cylinder clearance for the oversize piston must be: 0.035–0.056 mm (0.0014–0.0022 in).



## CYLINDER HEAD/CYLINDER/PISTON

Inspect the top of the cylinder for warpage.

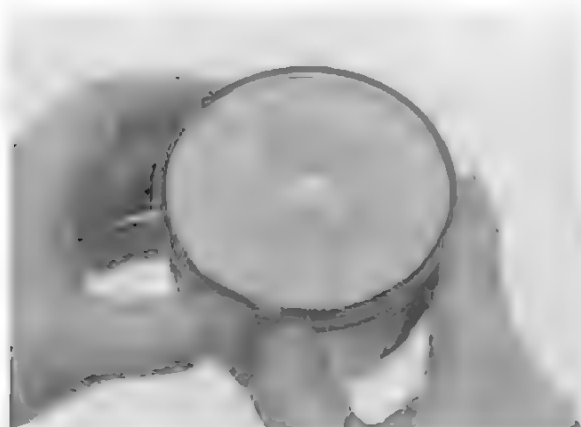
**SERVICE LIMIT: 0.10 mm (0.004 in)**



### PISTON

*Do not damage the piston rings during removal.*

Remove the piston rings.



Remove any carbon deposits from the piston ring grooves, using an old piston ring as shown.



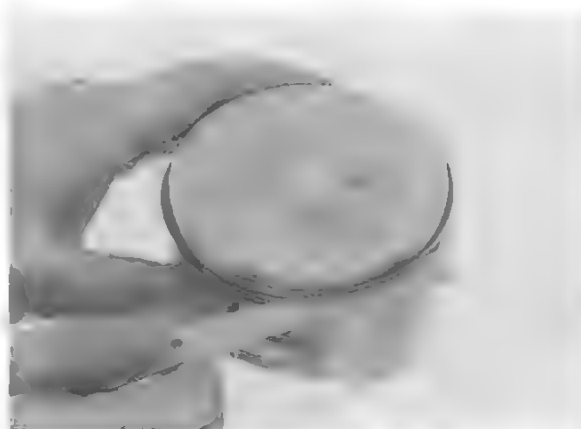
Temporarily install the piston rings to their proper position with the mark facing up.

Measure the piston ring-to-ring groove clearance with the rings pushed into the grooves.

#### **SERVICE LIMITS:**

**Top: 0.09 mm (0.004 in)**

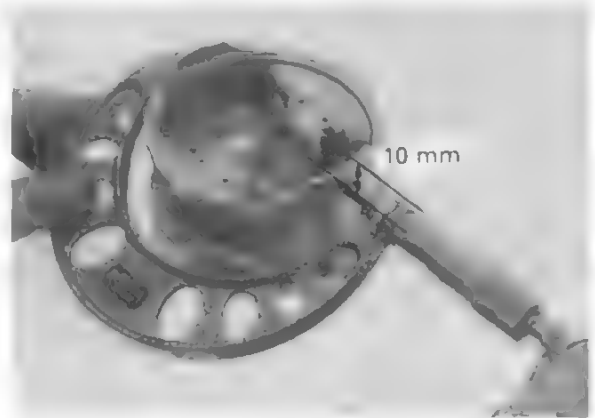
**Second: 0.09 mm (0.004 in)**



Inspect the piston for wear or damage.

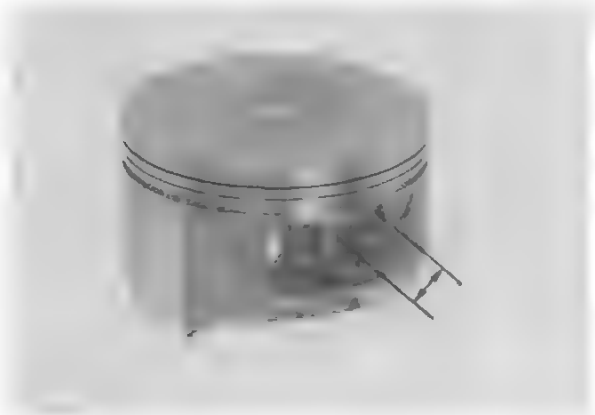
Measure the diameter of the piston at 10 mm (0.4 in) from the bottom and 90 degrees to the piston pin hole.

**SERVICE LIMIT: 89.90 mm (3.539 in)**



Measure the piston pin bore.

**SERVICE LIMIT: 19.08 mm (0.751 in)**

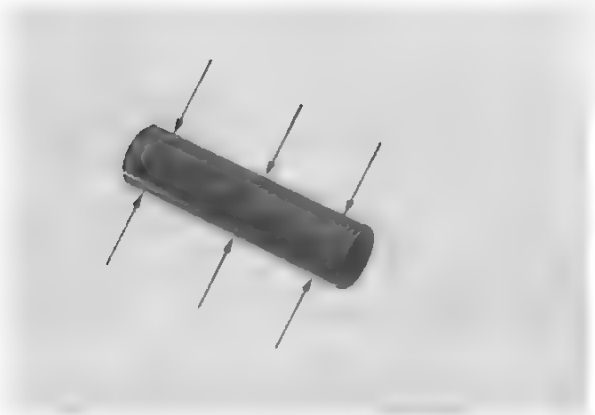


Measure the O.D. of the piston pin.

**SERVICE LIMIT: 18.96 mm (0.746 in)**

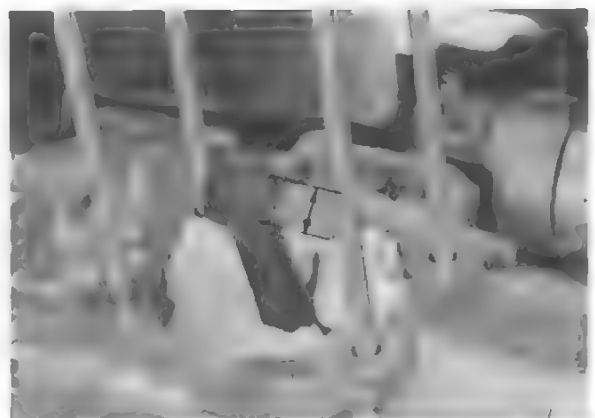
Calculate the piston-to-piston pin clearance.

**SERVICE LIMIT: 0.12 mm (0.039 in)**



Measure the connecting rod small end I.D.

**SERVICE LIMIT: 19.07 mm (0.7508 in)**



## CYLINDER HEAD/CYLINDER/PISTON

*Push the rings into the cylinder with the top of the piston to be sure they are squarely in the cylinder.*

Insert the piston ring squarely into the bottom of the cylinder and measure the ring end gap.

### SERVICE LIMITS:

**Top:** 0.5 mm (0.02 in)  
**Second:** 0.6 mm (0.02 in)



## PISTON RING INSTALLATION

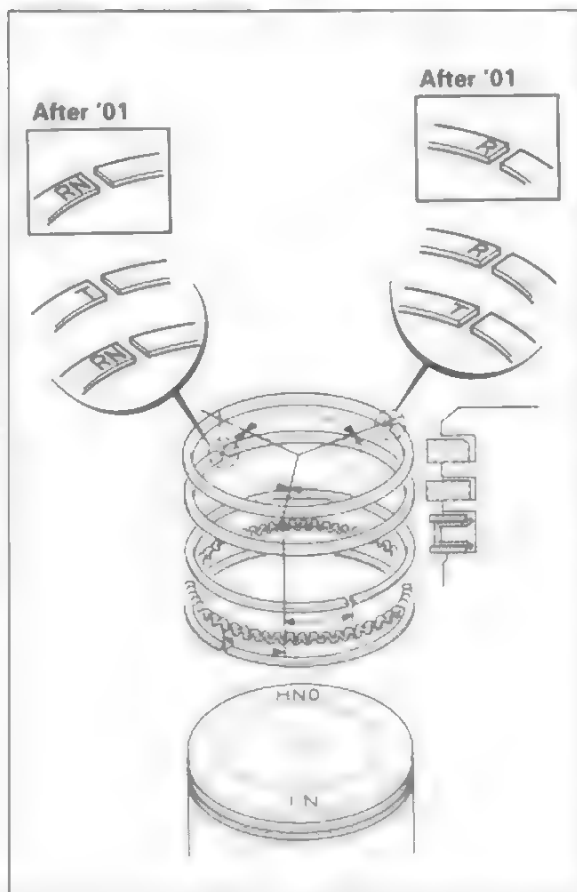
Clean the piston ring grooves thoroughly and install the piston rings.

### NOTE:

- Apply oil to the piston rings.
- Avoid piston and piston ring damage during installation.
- Install the piston rings with their markings facing up.
- Do not mix the top and second rings; the top ring is narrower than the second ring in width.

Space the piston ring end gaps 120 degrees apart. Do not align the gaps in the oil rings (side rails).

After installation, the rings should rotate freely in the ring grooves.



## CYLINDER/PISTON INSTALLATION

### PISTON INSTALLATION

Apply oil to the piston pin outer surface. Install the piston with its "IN" mark facing the intake side. Install the piston pin and secure it with new piston pin clips.

### NOTE:

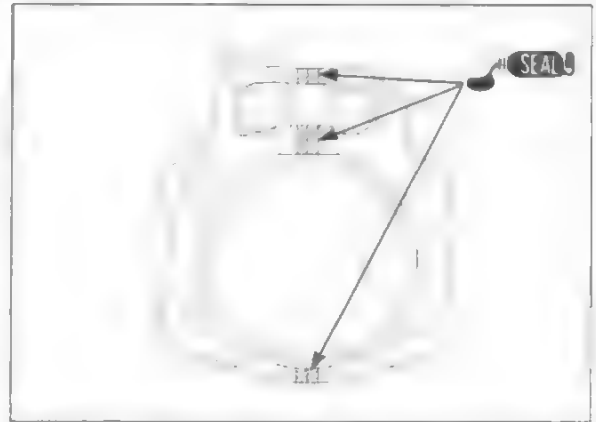
- Do not align the piston pin clips end gap with the piston cut-out.
- Do not let the piston pin clips fall into the crankcase.



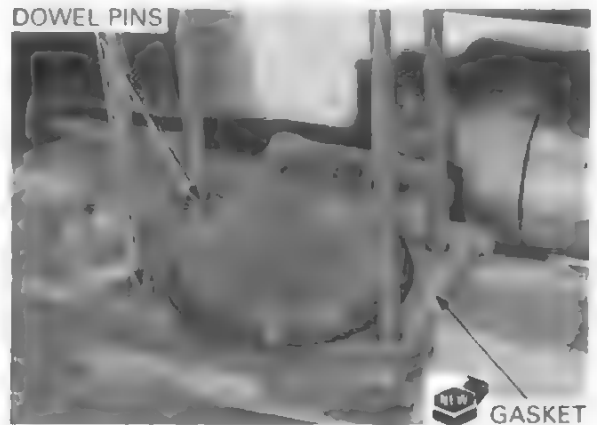
## CYLINDER INSTALLATION

Clean off any gasket materials from the crankcase surface.

Apply liquid sealant to the crankcase mating surface.



Install the dowel pins and a new gasket.



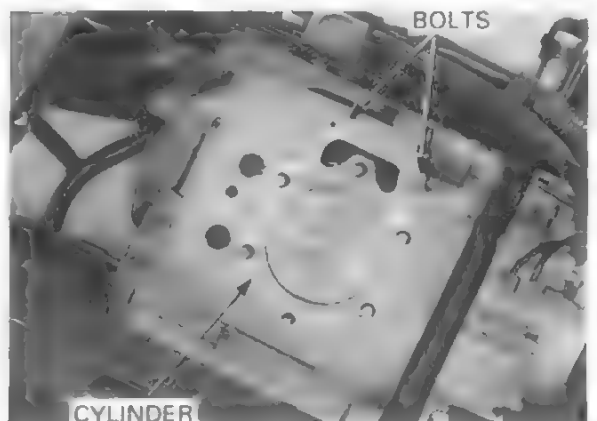
*Avoid piston ring damage during installation.*

Coat the cylinder bore and piston with engine oil and install the cylinder.



Install and tighten the cylinder mounting bolts.

Install the cylinder head and push rods (page 7-14).



## CAMSHAFT/CAM CHAIN TENSIONER

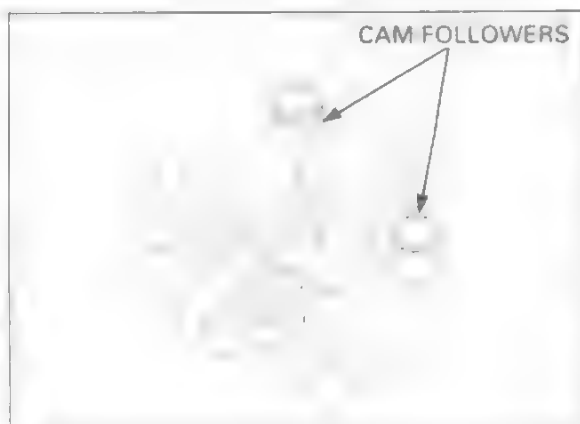
## CAMSHAFT REMOVAL

Remove the following:

- Cylinder head (page 7-4)
- Cylinder (page 7-16)
- Centrifugal clutch and change clutch (section 8)

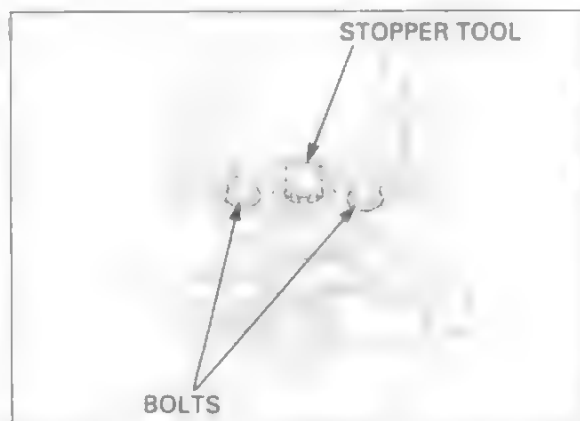
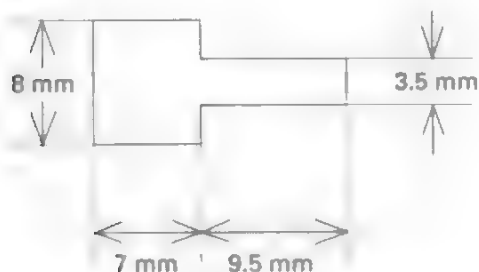
Remove the cam followers.

Mark the cam followers so they can be reinstalled in their original positions.



Turn the cam chain tensioner lifter shaft clockwise fully and secure it with a stopper tool.

This tool can easily be made from a thin (1 mm of thickness) piece of steel as shown below.



Remove the cam chain tensioner lifter mounting bolts and tensioner.

Remove the cam sprocket bolts, sprocket from the camshaft flange.

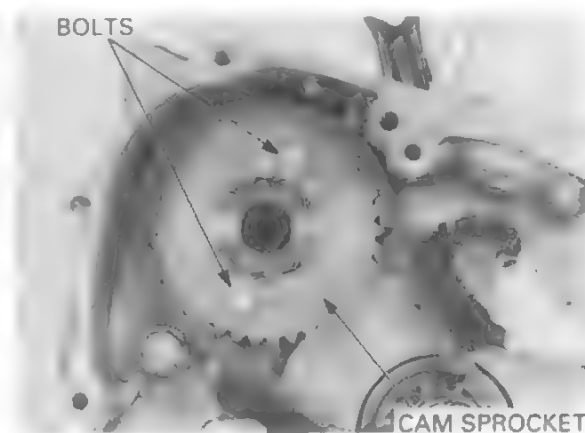
If it is necessary hold the end of the crankshaft to remove the cam sprocket bolts, use the special tool.

## TOOL :

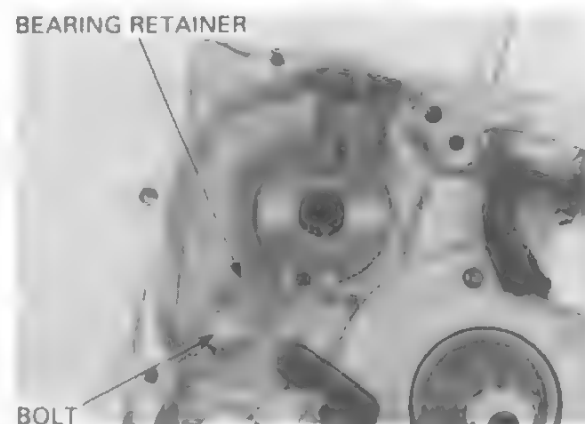
Main shaft Holder

07JMB-MN50200

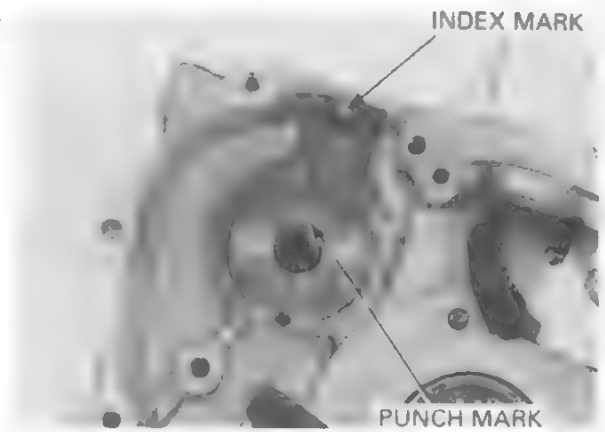
Remove the cam sprocket and cam chain.



Remove the camshaft bearing retainer bolt and retainer.



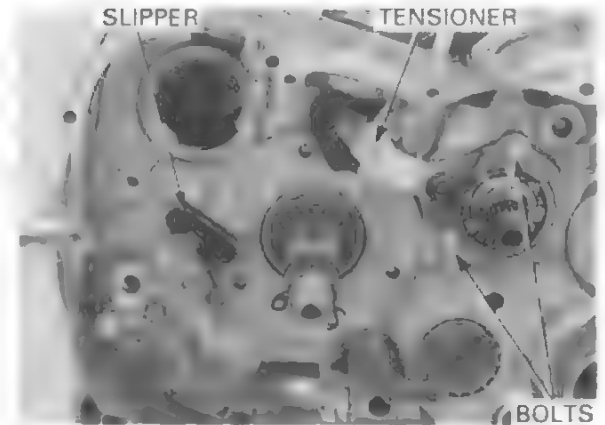
Align the punch mark on the cam sprocket with the index mark on the crankcase, then remove the camshaft.



### CAM CHAIN TENSIONER REMOVAL

Remove the mainshaft bearing retainer bolts and bearing retainer/cam chain tensioner assembly.

Remove the oil pump (page 4-8) and cam chain slipper.



### INSPECTION

#### Camshaft

Using a micrometer, measure the height of each cam lobe and inspect it for wear or damage.

#### SERVICE LIMITS:

IN: 36.25 mm (1.427 in)

EX: 36.10 mm (1.421 in)



Turn the camshaft bearing outer race with your finger.

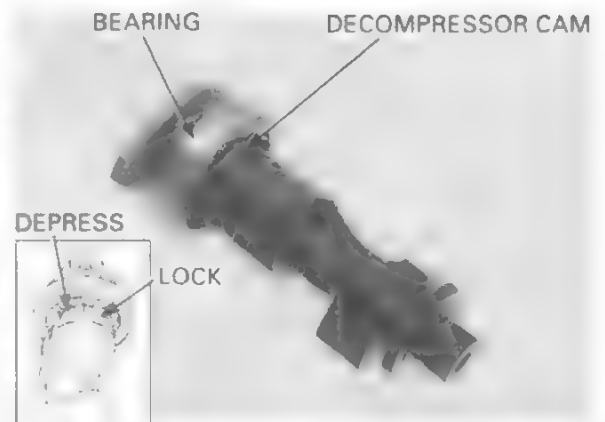
The bearing should be turn smoothly and quietly. Also check that the bearing inner race fits tightly on the camshaft.

Replace the camshaft as an assembly, if the races do not turn smoothly, quietly, or if they fit loosely on the camshaft.

Check the decompressor cam operation.

Look at the base of the exhaust lobe. Press on the decompressor cam as shown.

As you press on one side, the decompressor cam should lock above the exhaust base. As you press on the other side, the decompressor lobe should be depressed below the exhaust base.





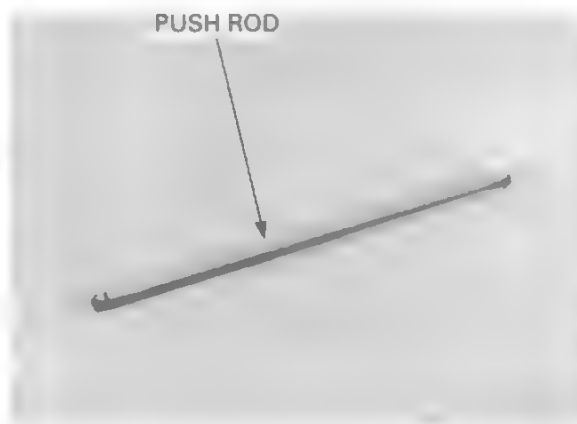
## CYLINDER HEAD/CYLINDER/PISTON

### Push rod

Check that the push rods are not bent.

### CAUTION:

*Do not disassemble the push rods, if you do, replace the push rods necessary.*

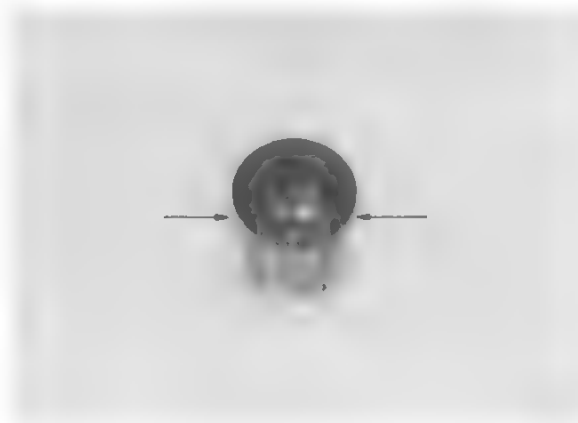


### Cam follower

Check the cam follower for damage.

Measure the cam follower O.D.

**SERVICE LIMIT: 22.46 mm (0.884 in)**



Measure the crankcase I.D. at the cam follower sliding surface.

**SERVICE LIMIT: 22.54 mm (0.887 in)**

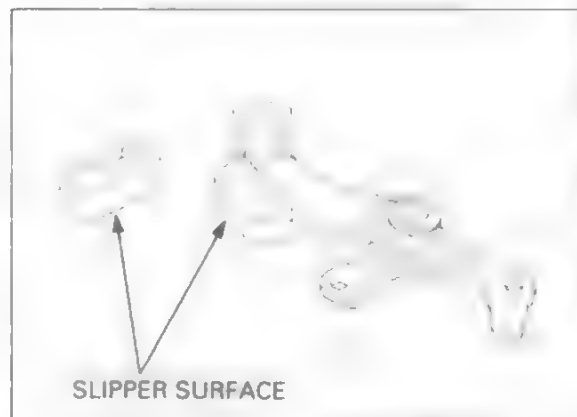
Calculate the clearance.

**SERVICE LIMIT: 0.07 mm (0.003 in)**



### Cam chain tensioner

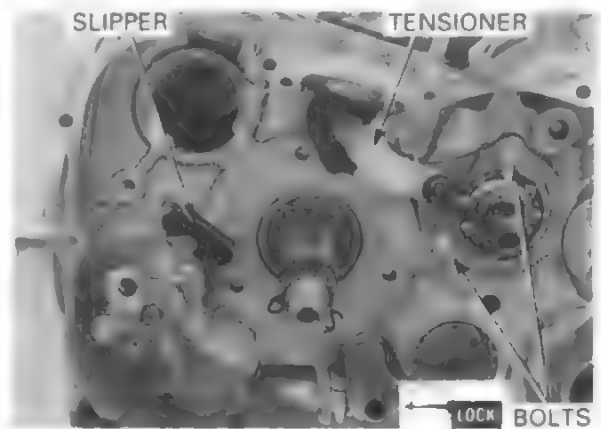
Check the slipper surface of the cam chain tensioner arm for wear or damage.



## CAM CHAIN TENSIONER INSTALLATION

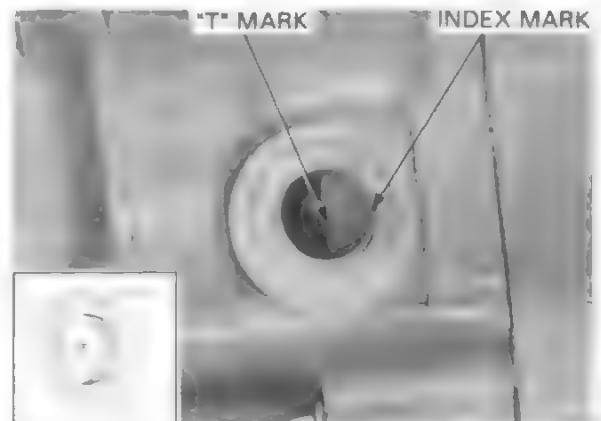
Apply a locking agent to the threads of the mainshaft bearing retainer bolts.  
Install the mainshaft bearing retainer/cam chain tensioner, tighten the bolts.

Install the cam chain slipper and oil pump (page 4-11).

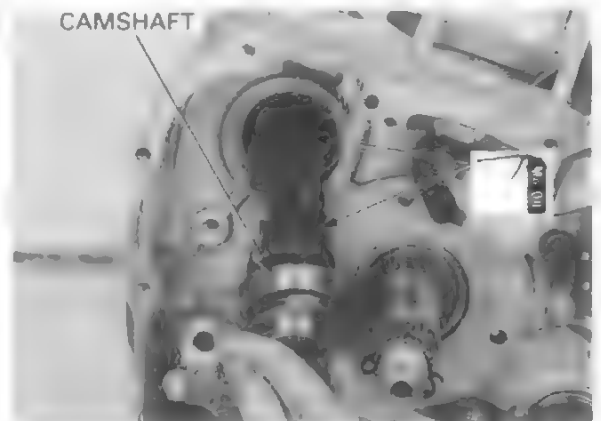


## CAMSHAFT INSTALLATION

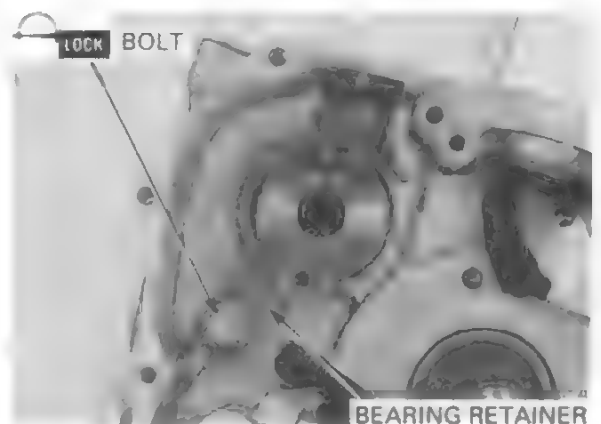
Align the "T" mark on the flywheel with the index mark on the rear crankcase by turning the recoil starter.



Apply molybdenum disulfide oil to the camshaft lobes and apply oil to the camshaft journal.  
Install the camshaft and camchain into the crankcase with its cam lobes facing down.

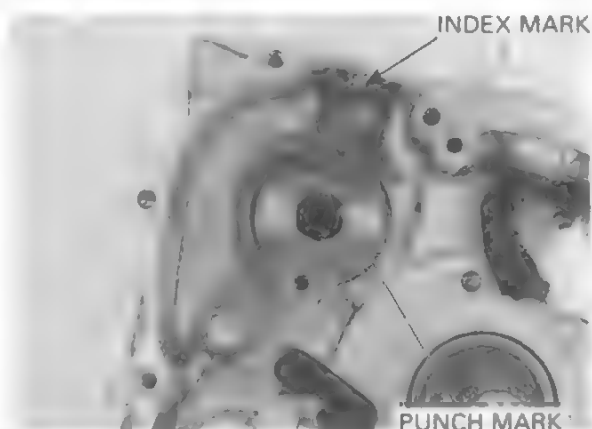


Install the camshaft bearing retainer aligning the groove of the retainer with the crankcase boss.  
Apply a locking agent to the retainer bolt threads.  
Install and tighten the bolts.



## CYLINDER HEAD/CYLINDER/PISTON

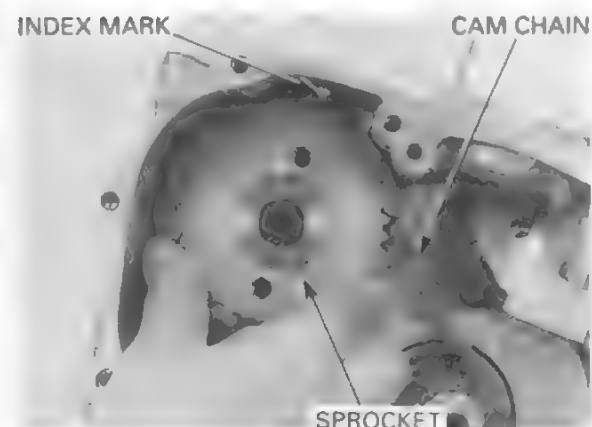
Align the punch mark on the camshaft flange with the index mark on the crankcase.



Align the punch mark on the cam sprocket with the index mark on the crankcase, then install the cam chain and cam sprocket onto the camshaft flange.

### NOTE:

Do not turn the crankshaft while installing the cam sprocket.

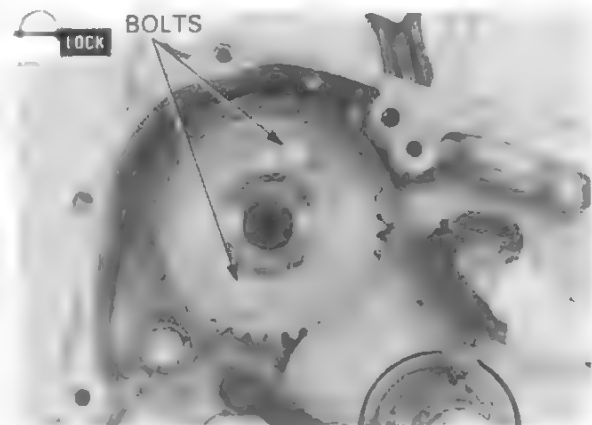


Apply a locking agent to the threads of the cam sprocket bolts.  
Install the cam sprocket bolts.  
Tighten the punch mark side bolt first then the other bolt.

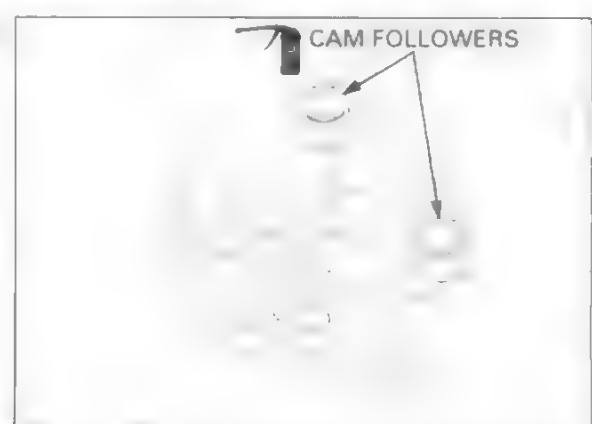
### NOTE:

Confirm that the "T" mark on the flywheel is aligned with the index mark on the rear crankcase cover, while the punch mark on the camshaft is aligned with the index mark on the front crankcase.

**TORQUE: 20 N·m (2.0 kgf·m, 14 lbf·ft)**

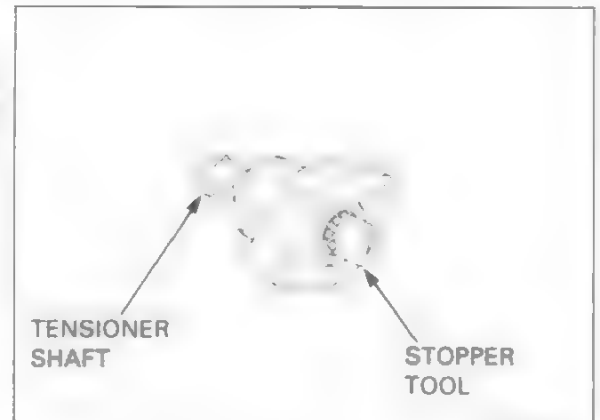


Apply clean engine oil to the outer and inner surface of the cam followers.  
Install the cam follower into the crankcase.



**INSTALLATION**

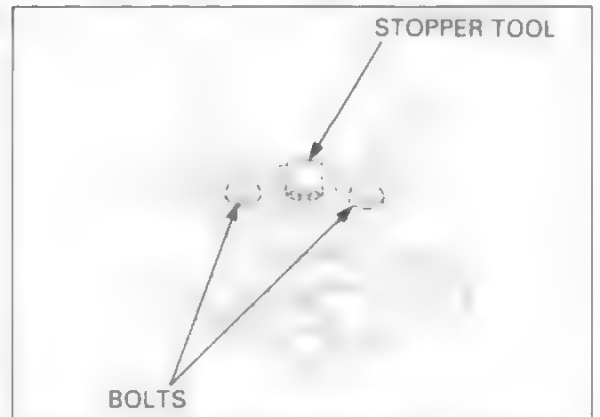
Turn the tensioner shaft clockwise with the stopper tool to retract the tensioner, then insert the stopper fully to hold the tensioner in the fully retracted position.



Install a new gasket on the cam chain tensioner lifter.



Install the cam chain tensioner lifter and tighten the bolts.



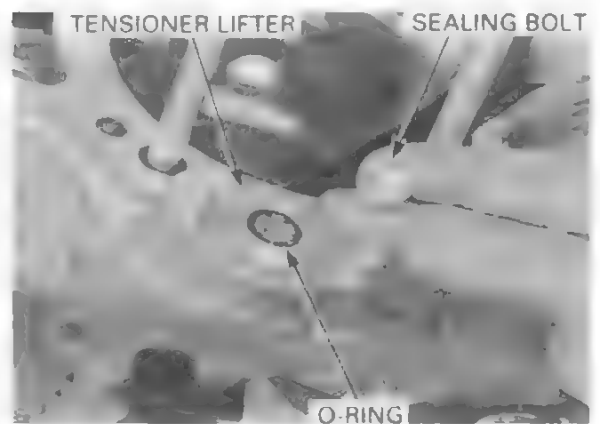
Remove the holder tool from the tensioner lifter.

Check the O-ring is in good condition, install the sealing screw.

**TORQUE: 4 N·m (0.4 kgf·m, 3 lbf·ft)**

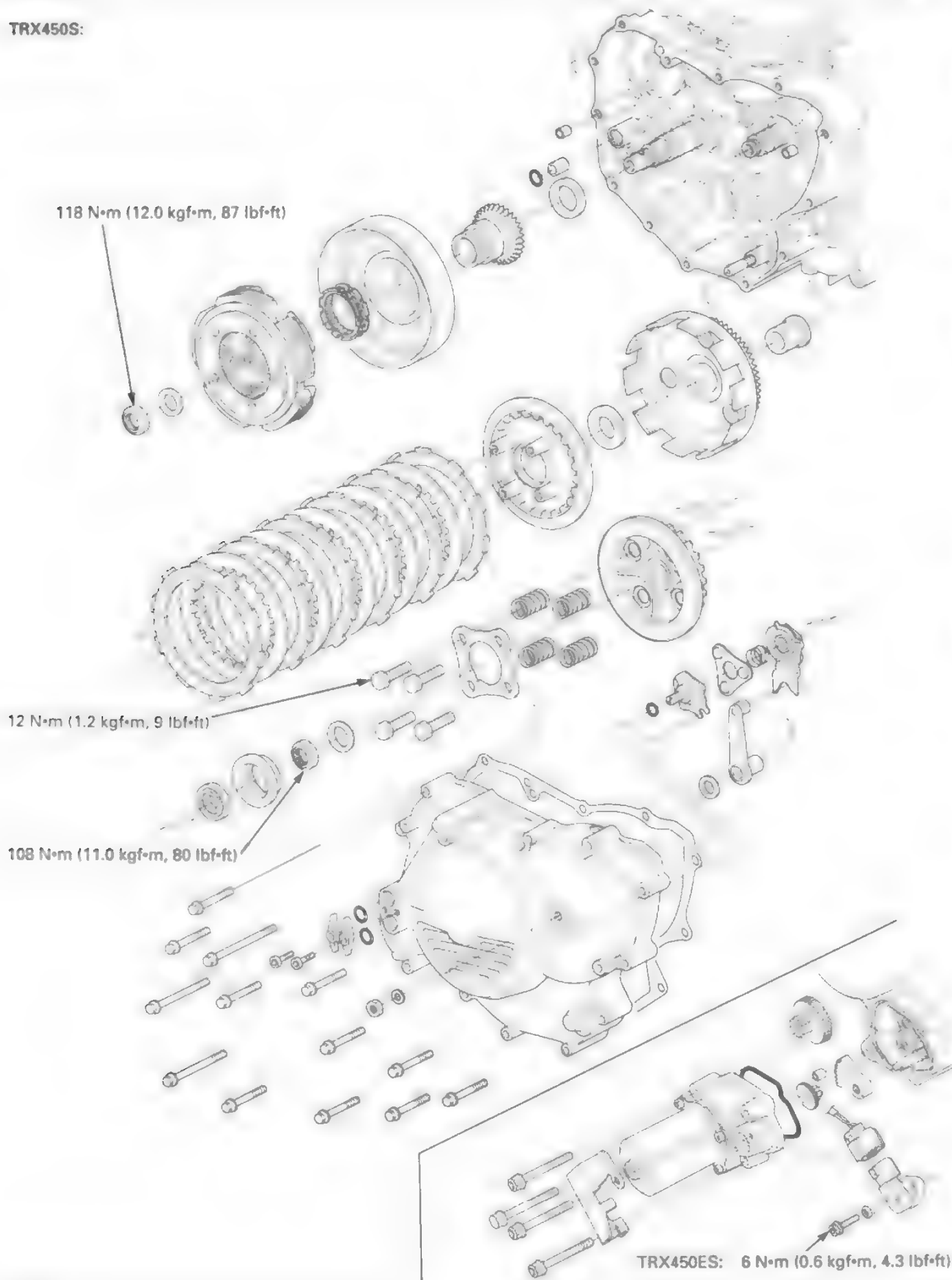
Install the following:

- Change clutch and centrifugal clutch (section 8)
- Cylinder (page 7-20)
- Cylinder head (page 7-14)



## CLUTCH

**TRX450S:**



# 8. CLUTCH

SERVICE INFORMATION	8-1	CENTRIFUGAL CLUTCH	<u>8-4</u>
TROUBLESHOOTING	8-2	CHANGE CLUTCH	8-12
FRONT CRANKCASE COVER REMOVAL	8-3	FRONT CRANKCASE COVER INSTALLATION	8-18

## SERVICE INFORMATION

### GENERAL

- This section covers removal and installation of the centrifugal clutch, change clutch.
- These parts can be serviced with the engine installed in the frame.
- TRX 450 ES must have the electric shift control motor and reduction gears removed before servicing (section 21).

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Change clutch	Spring free length	32.1 (1.26)	31.0 (1.22)
	Disc thickness	2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage	—	0.20 (0.008)
	Clutch outer guide	O.D. 27.959 – 27.980 (1.1007 – 1.1016)	27.92 (1.099)
		I.D. 22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
	Mainshaft O.D. at outer guide	21.972 – 21.993 (0.8650 – 0.8659)	21.93 (0.863)
Centrifugal clutch	Drum I.D.	140.0 – 140.2 (5.51 – 5.52)	140.4 (5.53)
	Weight lining thickness	3.0 (0.12)	2.0 (0.08)
	Clutch spring height	3.1 (0.12)	2.95 (0.116)
	Clutch weight spring free length	21.6 (0.85)	22.5 (0.89)
Primary drive gear	I.D.	27.000 – 27.021 (1.0630 – 1.0638)	27.05 (1.065)
	Crankshaft O.D. at drive gear	26.959 – 26.980 (1.0614 – 1.0622)	26.93 (1.060)

### TORQUE VALUES

Centrifugal clutch outer lock nut  
Clutch spring bolt  
Change clutch center lock nut  
Angle sensor

118 N•m (12.0 kgf•m, 87 lbf•ft) Apply oil to the threads  
12 N•m (1.2 kgf•m, 9 lbf•ft)  
108 N•m (11.0 kgf•m, 80 lbf•ft) Apply oil to the threads  
6 N•m (0.6 kgf•m, 4 lbf•ft)

## CLUTCH

---

### TOOLS

Remover handle	07936-3710100	
Bearing remover, 17 mm	07936-3710300	
Remover weight	07741-0010201	or 07936-371020A or 07936-3710200
Clutch holder	07GMB-HA70101	or 07GMB-HA7010A or 07GMB-HA7011A and 07GMB-HA7012A
Clutch center holder	07JMB-MN50300	or 07HGB-001010B and 07HGB-001020B (U.S.A. only)
Clutch puller	07933-HA80000	or 07933-HB3000A (U.S.A. only)
Driver	07749-0010000	
Attachment, 42 X 47 mm	07746-0010300	
Pilot, 17 mm	07746-0040400	
Driver, 22 mm I.D.	07746-0020100	
Attachment, 20 mm I.D.	07746-0020400	

### TROUBLESHOOTING

Faulty clutch operation can usually be corrected by adjusting the clutch.

#### **Clutch slips when accelerating**

- Faulty clutch lifter
- Discs/plates worn
- Weak springs

#### **Clutch will not disengage**

- Faulty clutch lifter mechanism
- Plates warped

#### **The vehicle creeps with clutch disengaged**

- Faulty centrifugal clutch
- Plate warped

#### **Clutch operating feels rough**

- Outer drum slots rough
- Incorrect idle speed adjustment

#### **Hard to shift**

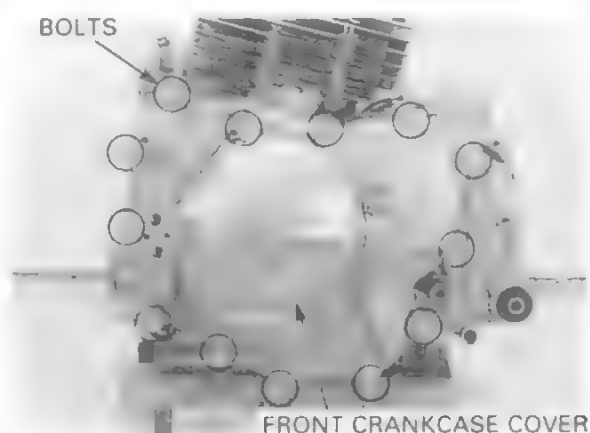
- Incorrect clutch adjustment
- Faulty clutch lifter mechanism
- Shift drum cam plate damaged

## FRONT CRANKCASE COVER REMOVAL

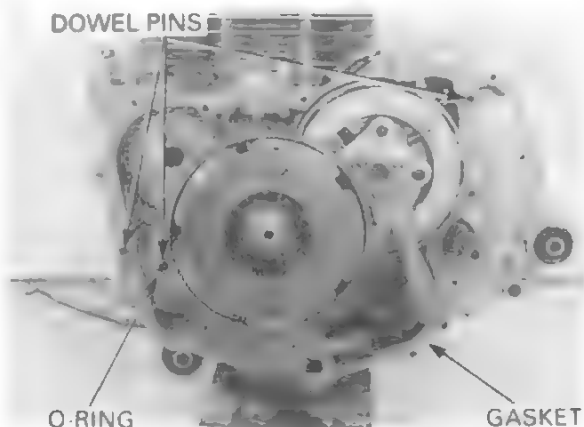
Drain the engine oil (page 3-11).  
Remove the oil cooler pipes (page 4-2).  
Remove the right engine side cover.

*TRX450ES only* Remove the front propeller shaft (page 6-4) and control motor (page 21-28).

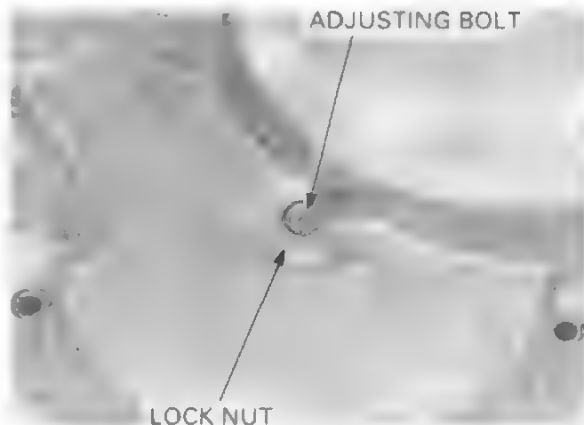
Remove the bolts and front crankcase cover.



Remove the gasket, O-ring and three dowel pins.

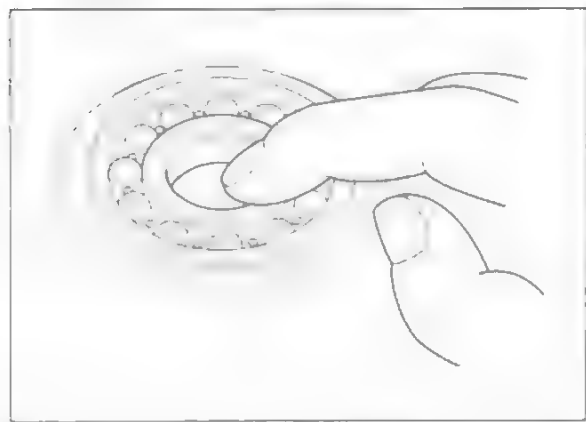


Remove the clutch adjusting bolt lock nut, then remove the clutch adjusting plate.



## BEARING REPLACEMENT

Turn the crankshaft end bearing inner race with your finger.  
The bearing should turn smoothly and quietly.  
Also check that the bearing outer race fits tightly in the crankcase cover.  
Replace it if necessary.





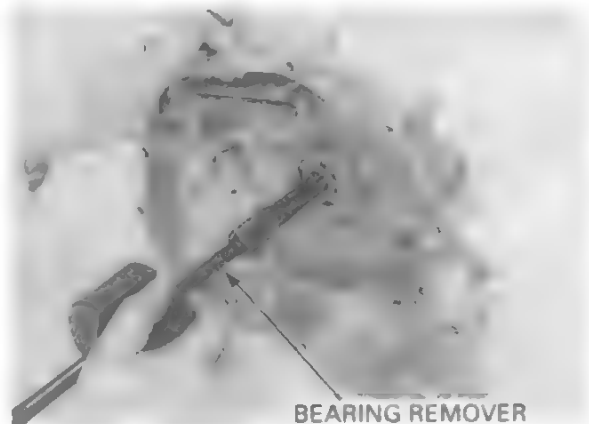
## CLUTCH

Remove the crankshaft end bearing from the front crankcase cover using the special tools as shown.

### TOOLS:

Remover handler  
Bearing remover, 17 mm  
Remover weight

07936-3710100  
07936-3710300  
07741-0010201 or  
07936-3710200 or  
07936-371020A

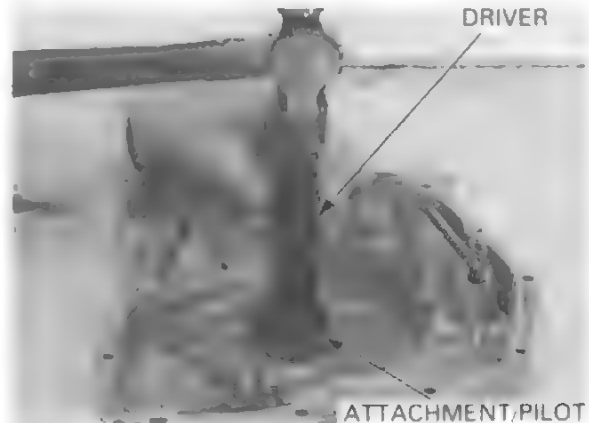


Drive a new crankshaft end bearing into the cover, with its sealed side facing the cover, using the special tools as shown.

### TOOLS:

Driver  
Attachment, 42 X 47 mm  
Pilot, 17 mm

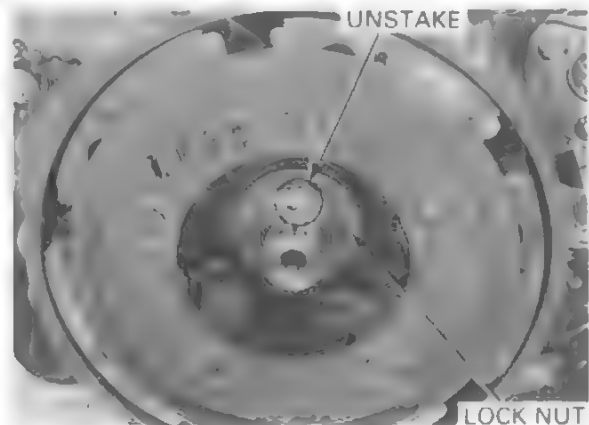
07749-0010000  
07746-0010300  
07746-0040400



## CENTRIFUGAL CLUTCH

### REMOVAL

Unstake the lock nut.



Hold the centrifugal clutch weight assembly with a clutch holder and remove the lock nut.

### TOOL:

Clutch holder

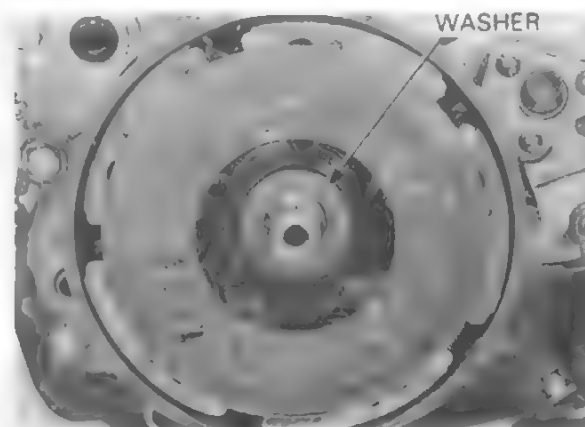
07GMB-HA70101 or  
07GMB-HA7010A  
(U.S.A. only) or  
07GMB-HA7011A  
07GMB-HA7012A

Clutch holder plate  
Clutch holder pins

Discard the lock nut.



Remove the washer.

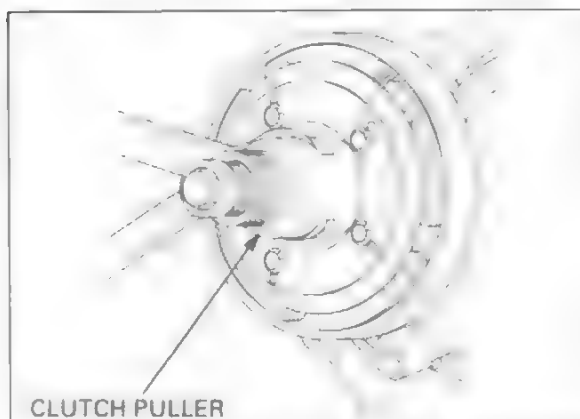


Remove the centrifugal clutch weight assembly using the special tool as shown.

## TOOL:

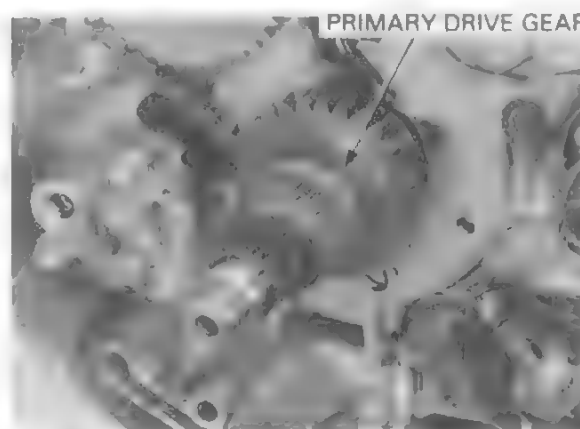
Clutch puller

07GMC-HB30100 or  
07933-HB3000A  
(U.S.A. only)



Remove the change clutch assembly (page 8-12).

Remove the primary drive gear and washer.

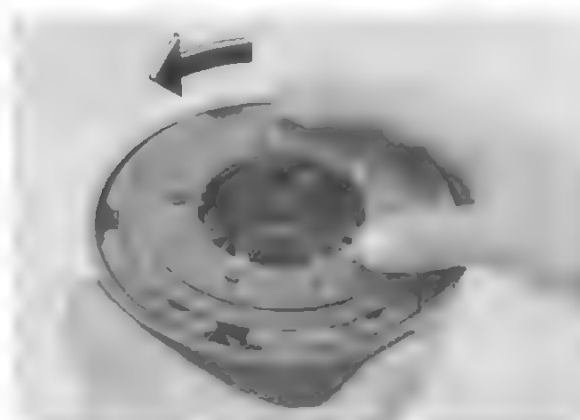


## INSPECTION

### One-way clutch

Hold the clutch drum and rotate the clutch weight assembly.

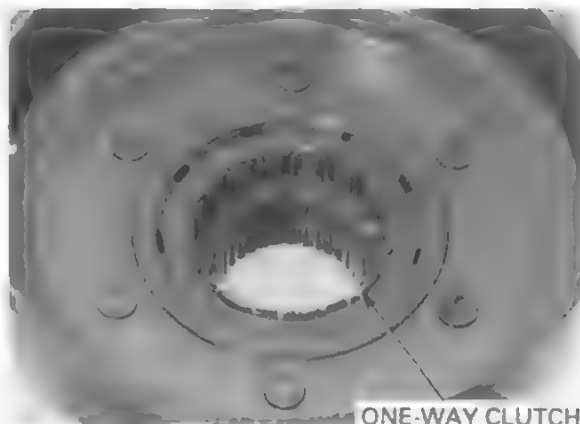
You should only be able to turn it counterclockwise.  
Remove the clutch weight assembly.



## CLUTCH

Remove the one-way clutch from the clutch drum.

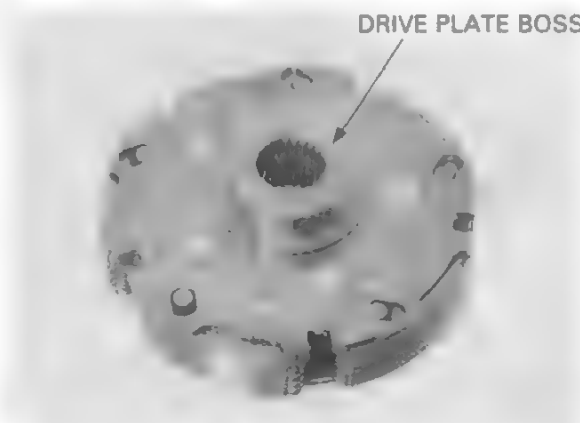
Inspect the one-way clutch for smooth operation and check the rollers for excessive wear.



ONE-WAY CLUTCH

### Drive plate boss

Check the drive plate boss for excessive wear or damage.



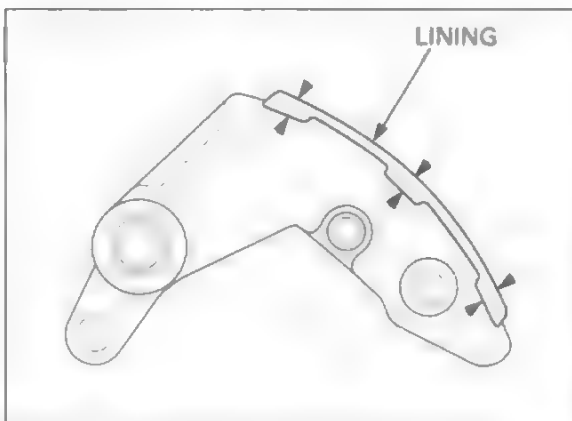
DRIVE PLATE BOSS

### Weight lining

Measure the weight lining thickness as shown.

**SERVICE LIMIT:** 2.0 mm (0.08 in)

For replacement, see page 8-7.



### Clutch drum

Check the inside of the centrifugal clutch drum for scratches or excessive wear. Replace if necessary.

Measure the I.D. of the clutch drum.

**SERVICE LIMIT:** 140.4 mm (5.53 in)

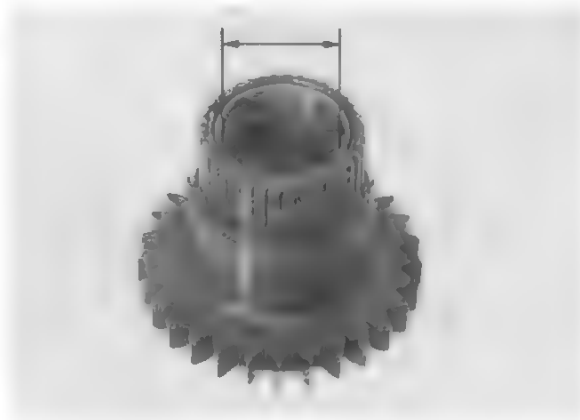


**Primary drive gear**

Inspect the primary drive gear for damage or excessive wear.

Measure the primary drive gear I.D.

**SERVICE LIMIT:** 27.05 mm (1.065 in)

**Weight spring/clutch spring**

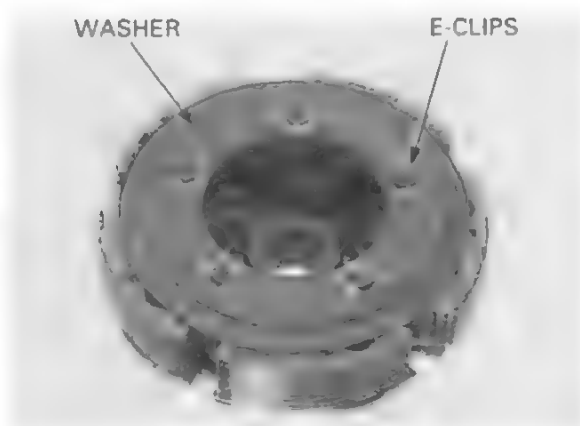
Remove the E-clips using screw driver.

**CAUTION:**

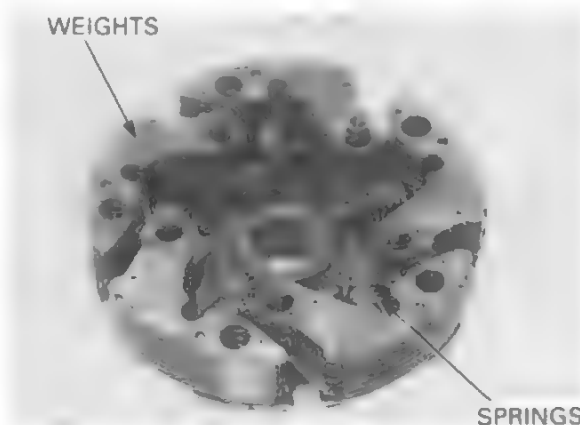
*When compressing the clutch spring, be careful not to damage the clutch weight assembly.*

Remove the following:

- Out side washer
- Clutch spring
- Inside washer



Remove the weight springs and clutch weights from the drive plate.



Measure the height of the clutch spring.

**SERVICE LIMIT:** 2.95 mm (0.116 in)

Replace the spring if it is shorter than the service limit.



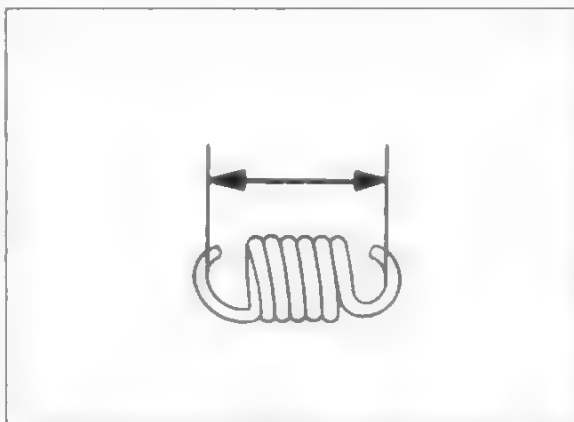
## CLUTCH

Check the weight springs for wear or damage, and replace if necessary.

Measure the length of the weight spring.

**SERVICE LIMIT:** 22.5 mm (0.89 in)

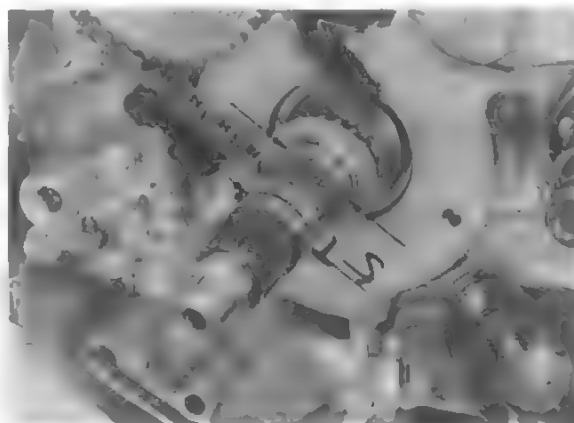
Replace the spring if they are longer than the service limit.



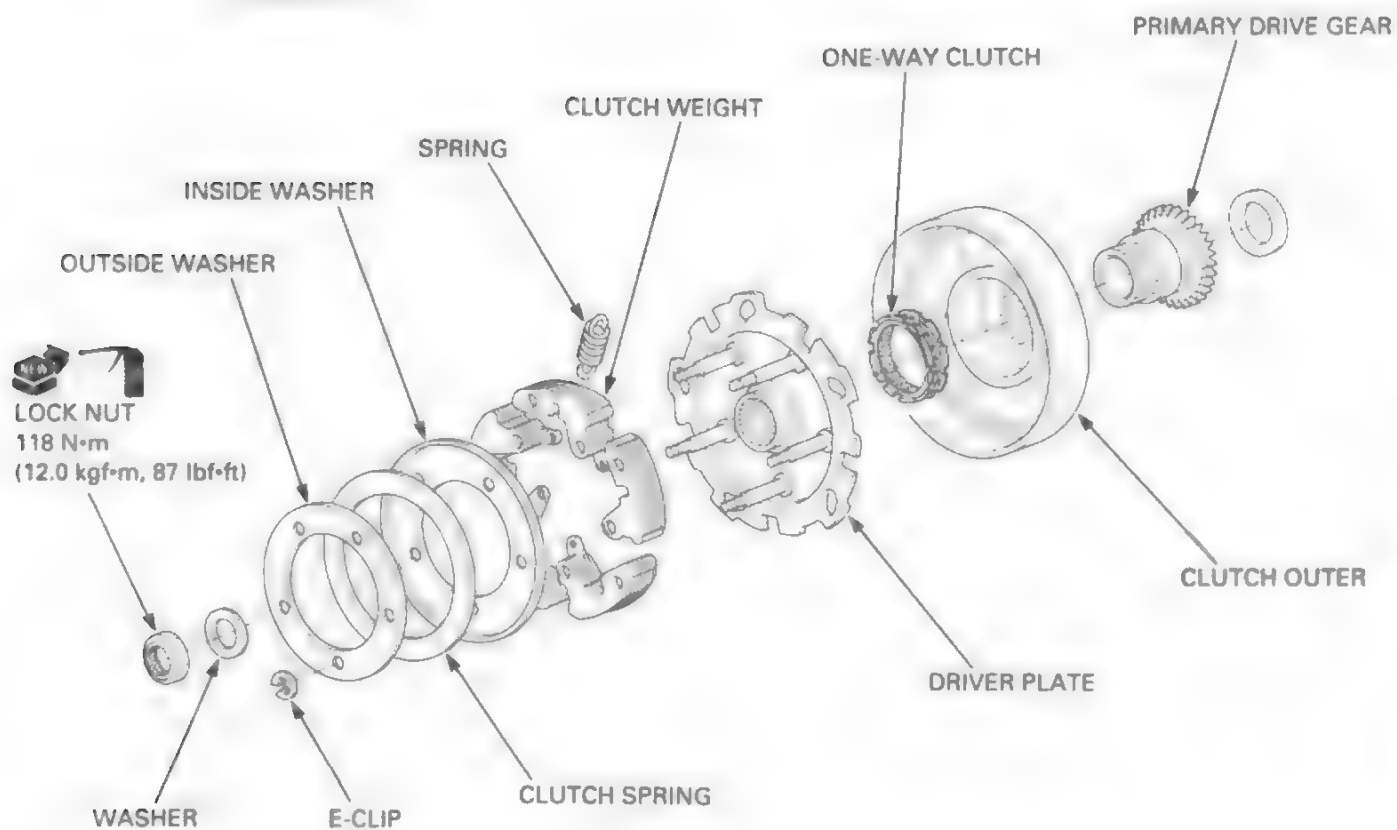
**Crankshaft at the primary drive gear**

Measure the crankshaft O.D. at two locations as shown.

**SERVICE LIMIT:** 26.93 mm (1.060 in)



## ASSEMBLY

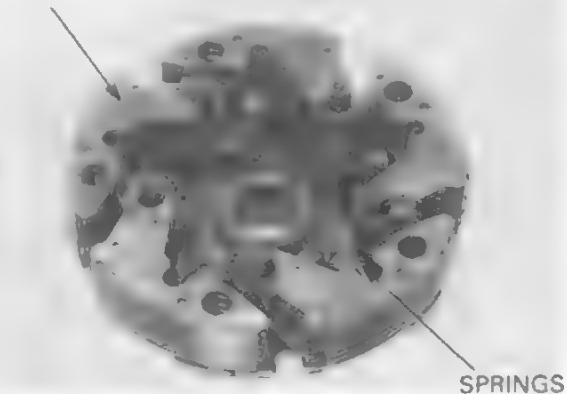


Install the clutch weights and springs onto the drive plate.

**NOTE:**

- Install the weights as shown.
- Install the springs with the open ends down.

WEIGHTS



SPRINGS

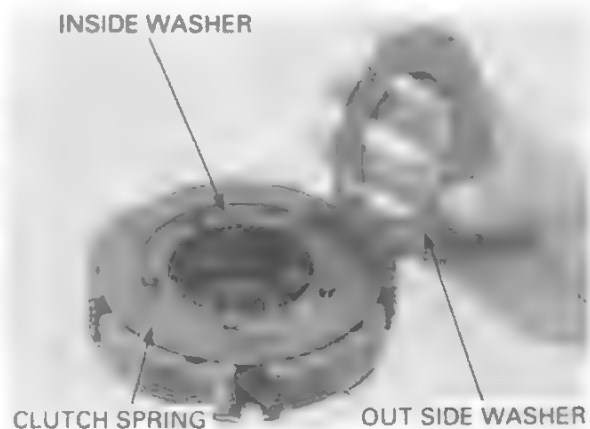
Install the inside washer and clutch spring.

**NOTE:**

Install the spring with the dished face down towards the inside as shown.

Install the outside washer with the locating pins facing out.

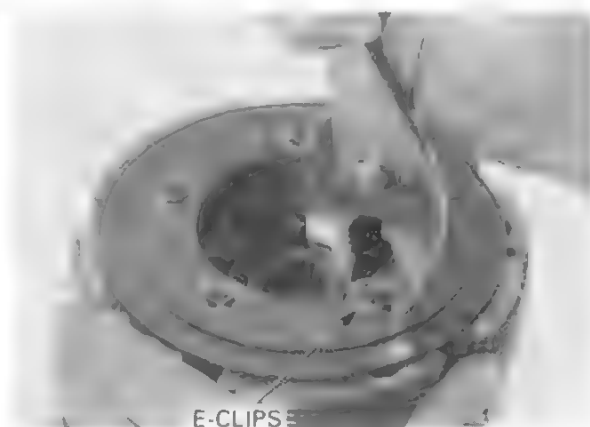
INSIDE WASHER



CLUTCH SPRING

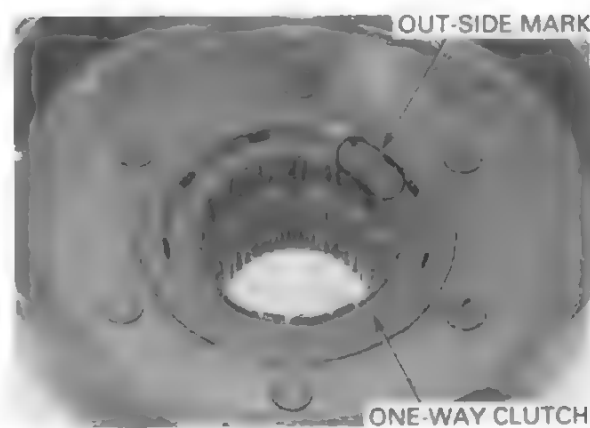
OUT SIDE WASHER

Install the E-clips with their gaps aligned with the locating pins.



E-CLIPS

Install the one-way clutch in the clutch drum with its "OUT-SIDE" mark facing out.



OUT-SIDE MARK

ONE-WAY CLUTCH

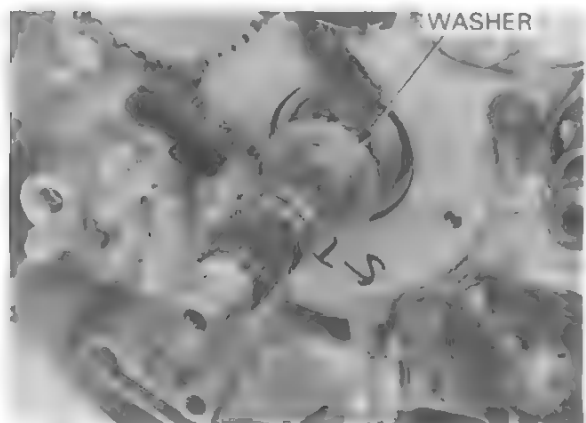
## CLUTCH

Install the centrifugal clutch weight assembly in the clutch drum, rotating the weight assembly counter-clockwise.



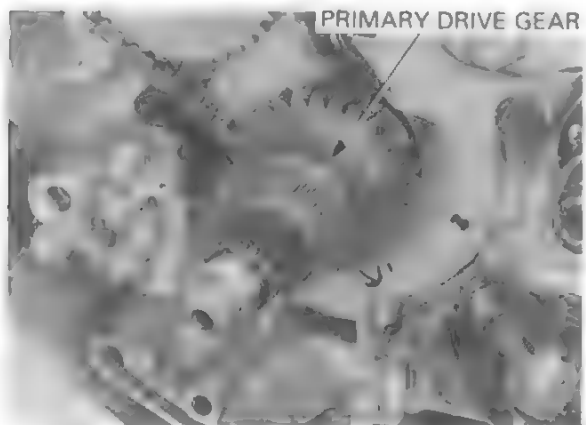
### INSTALLATION

Install the washer onto the crankshaft.



Install the primary drive gear.

Install the change clutch (page 8-16).



Install the centrifugal clutch weight assembly and clutch drum to the crankshaft.

#### NOTE:

How to install: First align the splines of the drive plate and crankshaft; and then rotating the clutch outer, align the splines of the primary drive gear and clutch outer.

Tap the clutch drum lightly using the special tools.

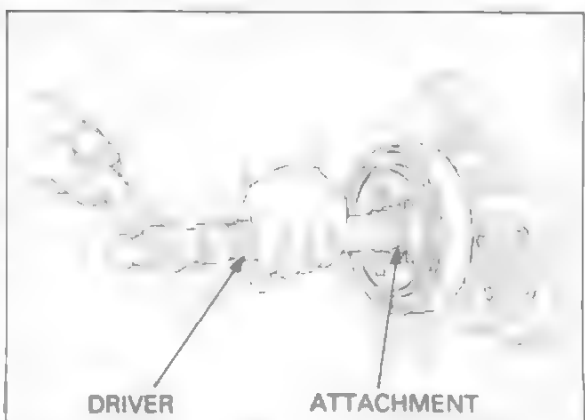
#### TOOLS:

Driver, 22 mm I.D.

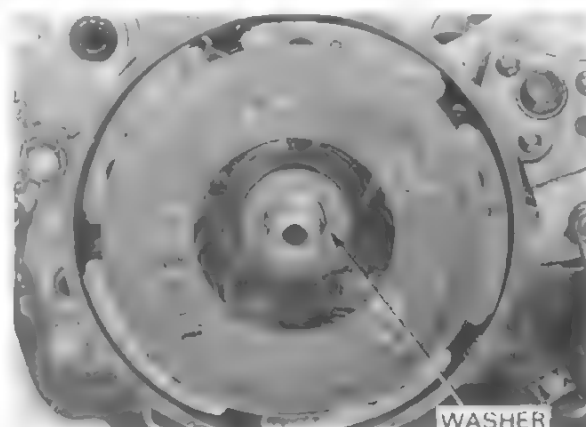
07746-0020100

Attachment, 20 mm I.D.

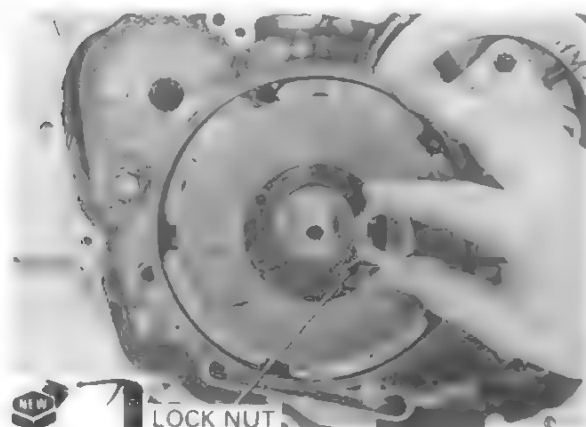
07746-0020400



Install the washer.



Apply oil to the new lock nut threads.  
Install the new lock nut.



Hold the centrifugal clutch weight assembly with the special tool and tighten the lock nut to the specified torque.

**TORQUE:** 118 N·m (12.0 kgf·m, 87 lbf·ft)

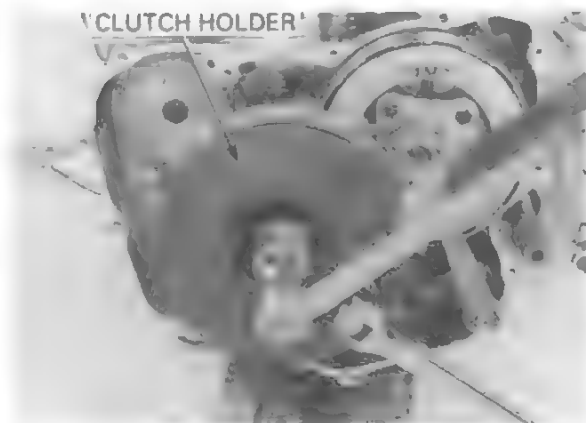
**TOOL:**

Clutch holder

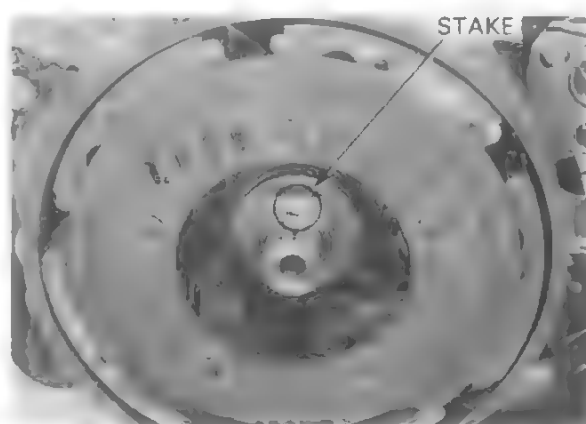
07GMB-HA70101 or  
07GMB-HA7010A  
(U.S.A. only) or

Clutch holder plate

07GMB-HA7011A  
07GMB-HA7012A



Stake the lock nut.  
Install the front crankcase cover (page 8-18).



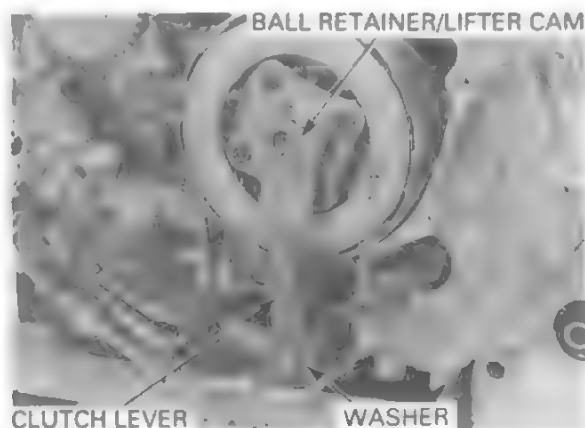


# CHANGE CLUTCH

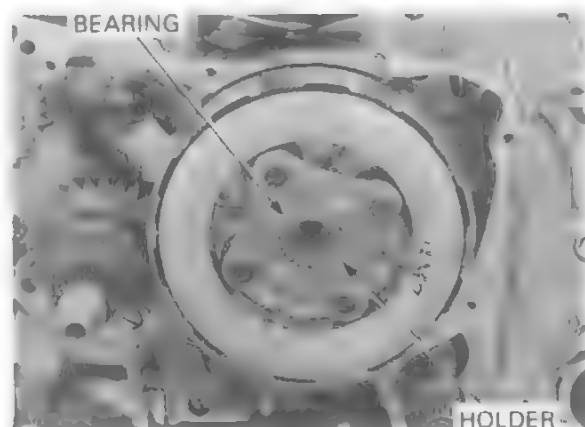
## REMOVAL

Remove the following:

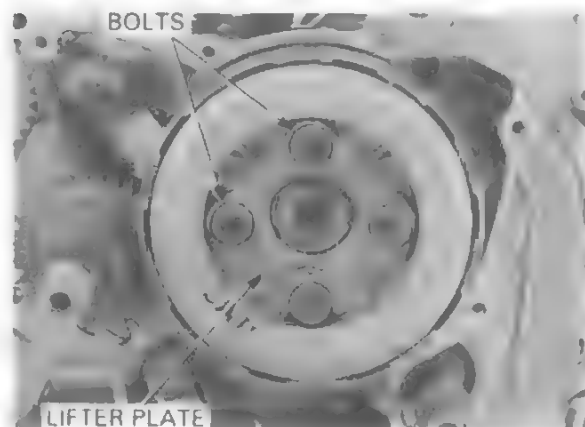
- Front crankcase cover (page 8-3)
- Centrifugal clutch (page 8-3)
- Clutch lever and washer
- Ball retainer and spring
- Lifter cam



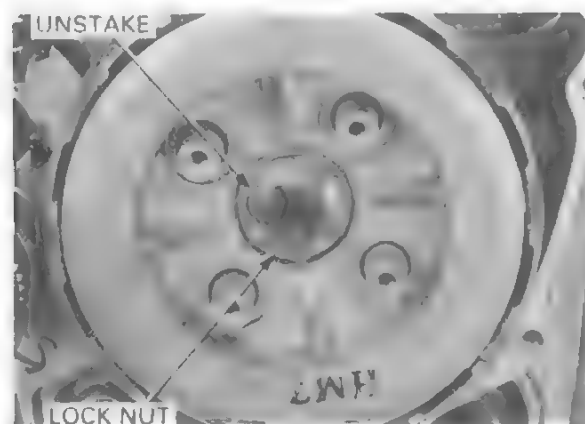
Remove the lifter bearing and bearing holder.



Remove the clutch bolts, loosening them in a criss-cross pattern in 2 or 3 steps.  
Remove the lifter plate and clutch springs.



Unstake the clutch center lock nut.



Install the special tool using four 6 X 55 mm bolts as shown, and remove the clutch lock nut.

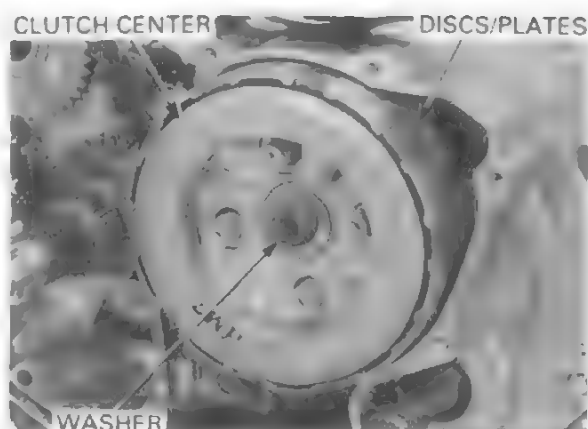
**TOOLS:**

Clutch center holder  
Holder plate

07JMB-MN50300 or  
07HGB-001010B  
(U.S.A. only) or  
07HGB-001010A  
(U.S.A. only)  
Holder collar  
07HGB-001020B  
(U.S.A. only) or  
07HGB-001020A  
(U.S.A. only)

Discard the lock nut.

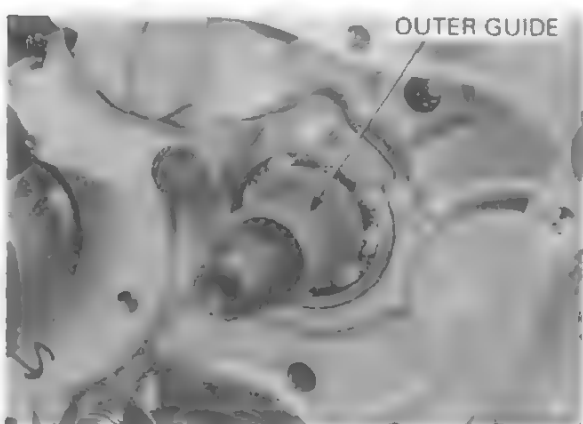
Remove the washer, clutch center, discs, plates and pressure plate as an assembly.



Remove the thrust washer and clutch outer.



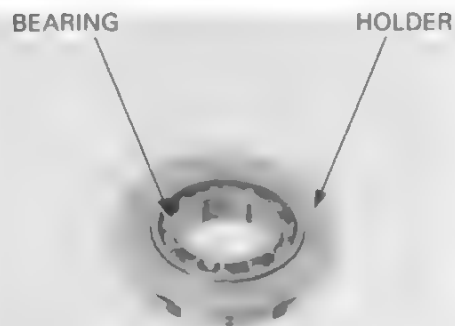
Remove the clutch outer guide from the mainshaft.



### INSPECTION

#### Clutch lifter bearing

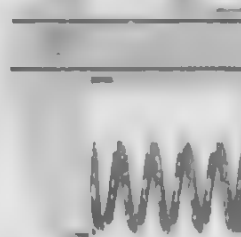
Turn the lifter bearing with your finger.  
The bearing should turn smoothly and freely without excessive play.  
If necessary replace the bearing.



#### Clutch spring

Measure the clutch spring free length.

**SERVICE LIMIT: 31.0 mm (1.22 in)**



#### Clutch center

Check the grooves of the clutch center for damage or wear caused by the clutch plates.  
Replace if necessary.



#### Clutch disc

Replace the clutch discs if they show signs of scoring or discoloration.

Measure the thickness of each disc.

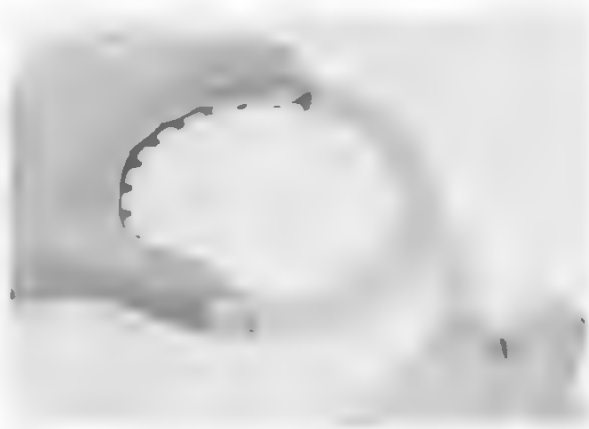
**SERVICE LIMIT: 2.3 mm (0.09 in)**



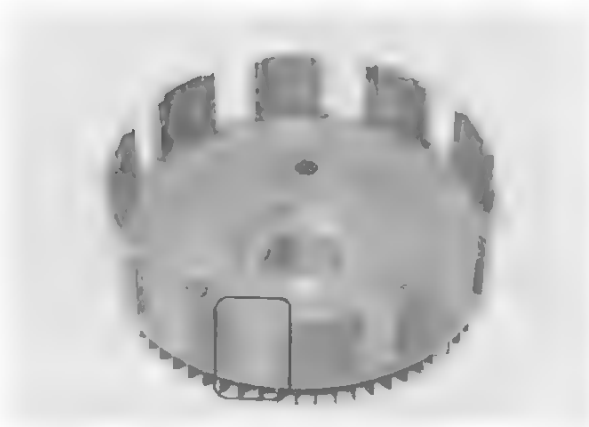
**Clutch plate**

Check each clutch plate for warpage on a surface plate using a feeler gauge.

**SERVICE LIMIT: 0.20 mm (0.008 in)**

**Clutch outer**

Check the slots of the clutch outer for damage or wear caused by the clutch discs. Replace if necessary.



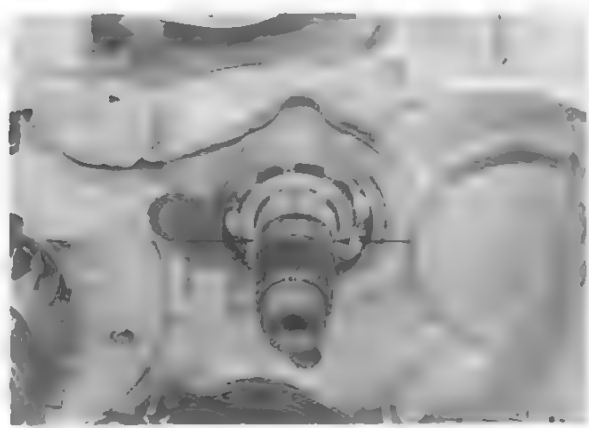
Measure the O.D. and I.D. of the clutch outer guide.

**SERVICE LIMIT: O.D.: 27.92 mm (1.099 in)**  
**I.D.: 22.05 mm (0.868 in)**

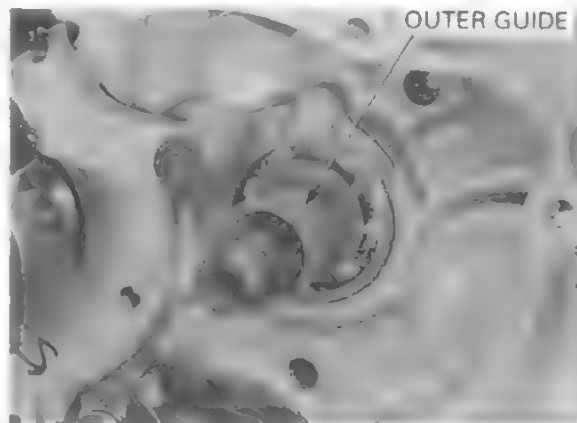
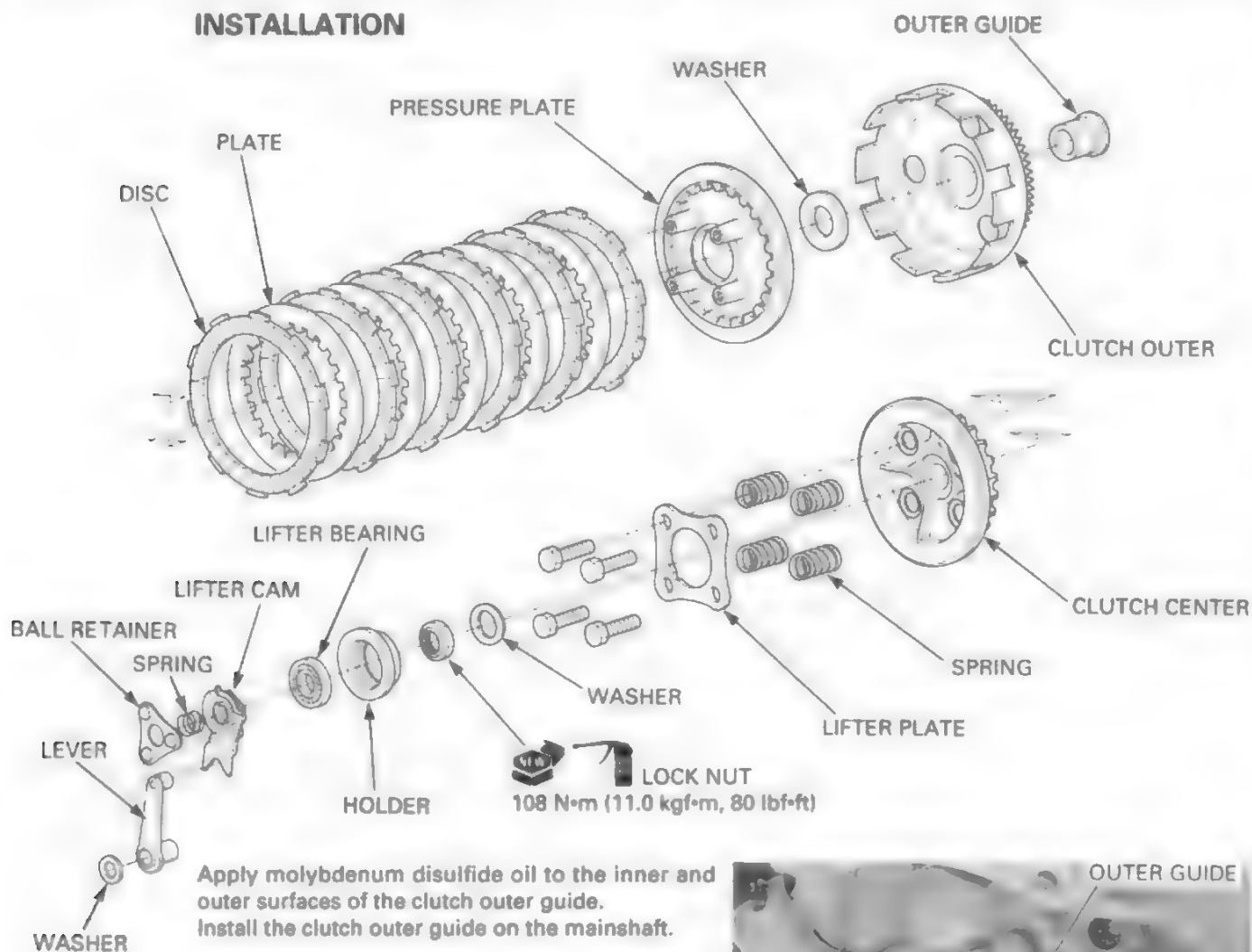
**Mainshaft at the clutch outer guide**

Measure the O.D. of the mainshaft.

**SERVICE LIMIT: 21.93 mm (0.863 in)**



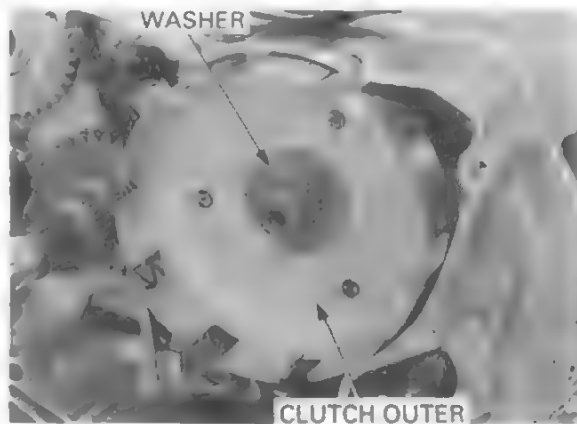
## INSTALLATION



Install the clutch outer an thrust washer.

### NOTE:

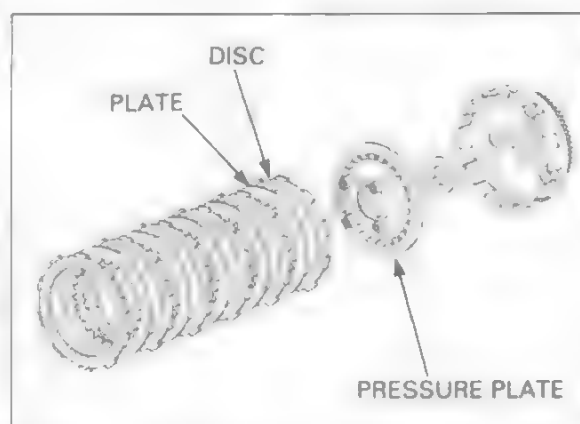
Confirm that the camshaft, primary drive gear, washer and the chain tensioner arm are installed.



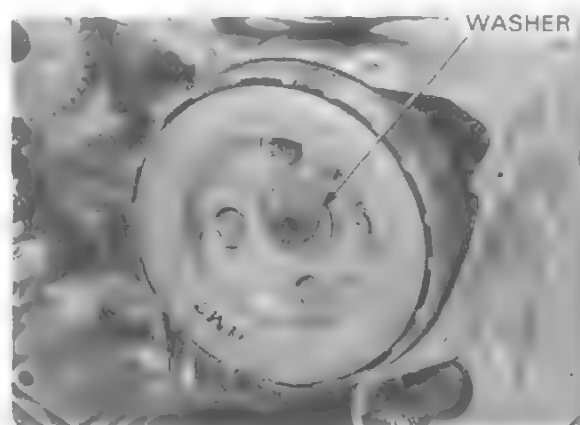
Assemble the clutch pressure plate, discs, plates and clutch center, and install them in the clutch outer. Coat new clutch discs with clean engine oil. Stack the discs and plates alternately.

**NOTE:**

Be sure the clutch center and pressure plate grooves are properly aligned, or the clutch will not operate properly.



Install the washer on the mainshaft.



Apply oil to the new lock nut threads.  
Install a new lock nut.  
Hold the clutch center using the special tool and four 6 X 55 mm bolts.  
Tighten the lock nut to the specified torque.

**TOOLS:**

Clutch center holder  
Holder plate

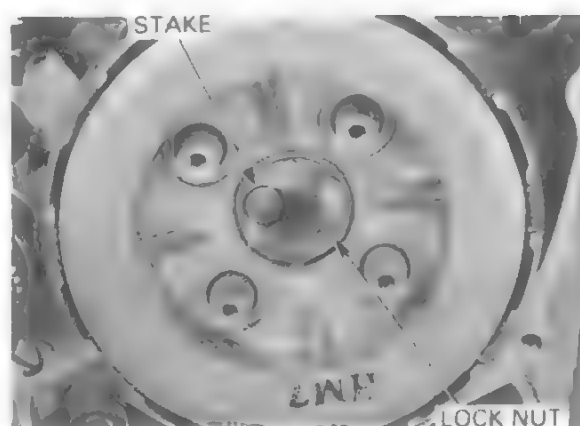
07JMB-MN50300  
07HGB-001010B  
(U.S.A. only) or  
07HGB-001010A  
(U.S.A. only)  
07HGB-001020B  
(U.S.A. only) or  
07HGB-001020A  
(U.S.A. only)

Holder collar



**TORQUE:** 108 N·m (11.0 kgf·m, 80 lbf·ft)

Stake the clutch center lock nut.



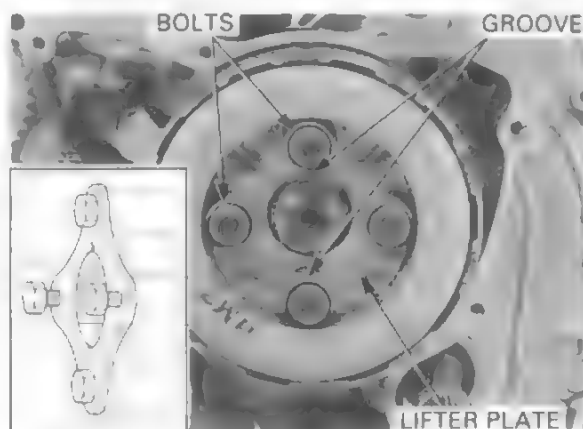
## CLUTCH

Install the clutch springs, lifter plate assembly and bolts.

Loosely tighten the clutch bolts.

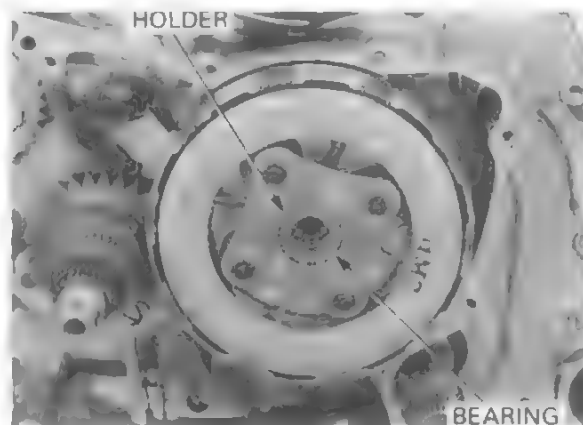
Then tighten the index groove side bolts first; to center the clutch lifter plate.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**



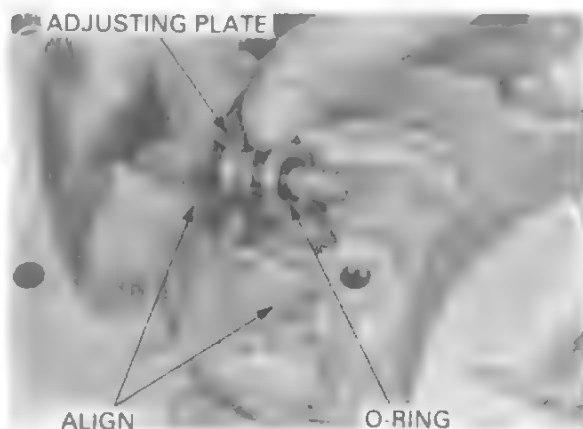
Install the following:

- Lifter bearing holder
- Lifter bearing
- Lifter cam
- Clutch lever aligning it between the wide splines and centering in the lifter cam
- Centrifugal clutch (page 8-10)
- Front crankcase cover

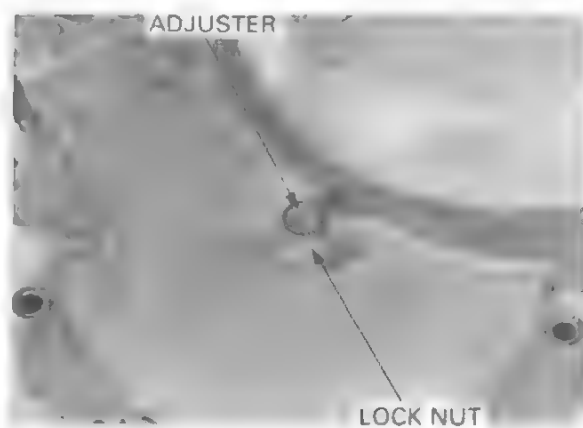


## FRONT CRANKCASE COVER INSTALLATION

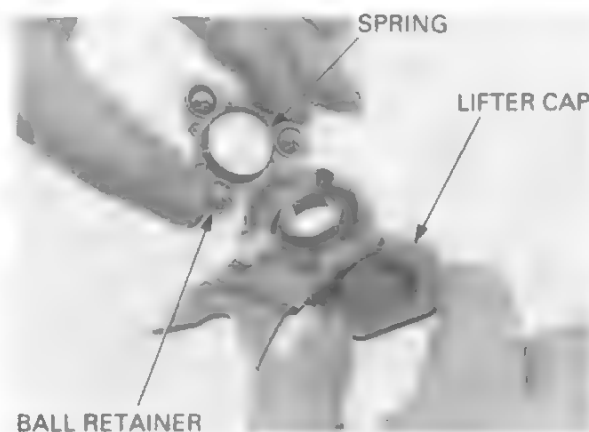
Install the O-ring and clutch adjusting plate by aligning its cut-out with the crankcase cover stopper pin.



Install the washer and adjuster lock nut.



Apply grease to the clutch lifter cap.  
Install the ball retainer and spring to the clutch lifter cam.



Apply oil to the clutch lever.  
Install the clutch lifter cam and ball retainer to the clutch lifter plate as shown.

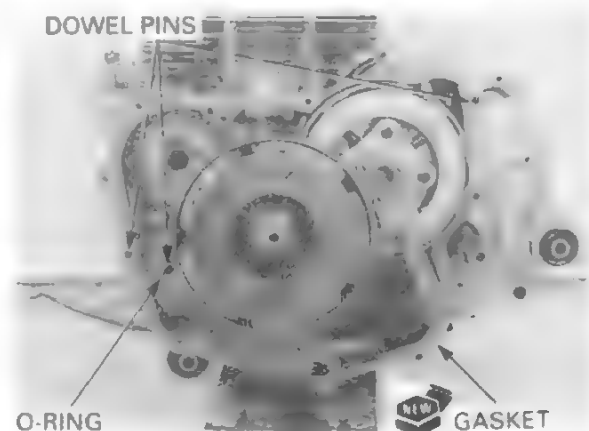
**NOTE:**

Make sure the clutch lever points toward the center of clutch as shown.



Install the O-ring and dowel pin onto the oil pump.

Install the dowel pins and new gasket.



Install the front crankcase cover and tighten the thirteen bolts in 2 or 3 steps in a crisscross pattern.

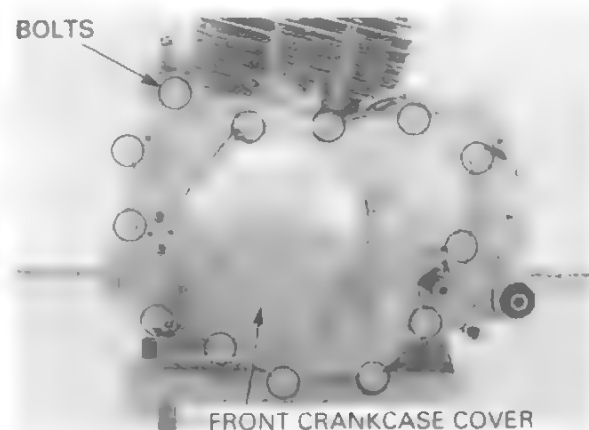
Install the right engine side cover.

Install the oil cooler pipe (page 4-3).

**TRX450ES** Install the front propeller shaft (page 6-4) and control motor (page 21-28)

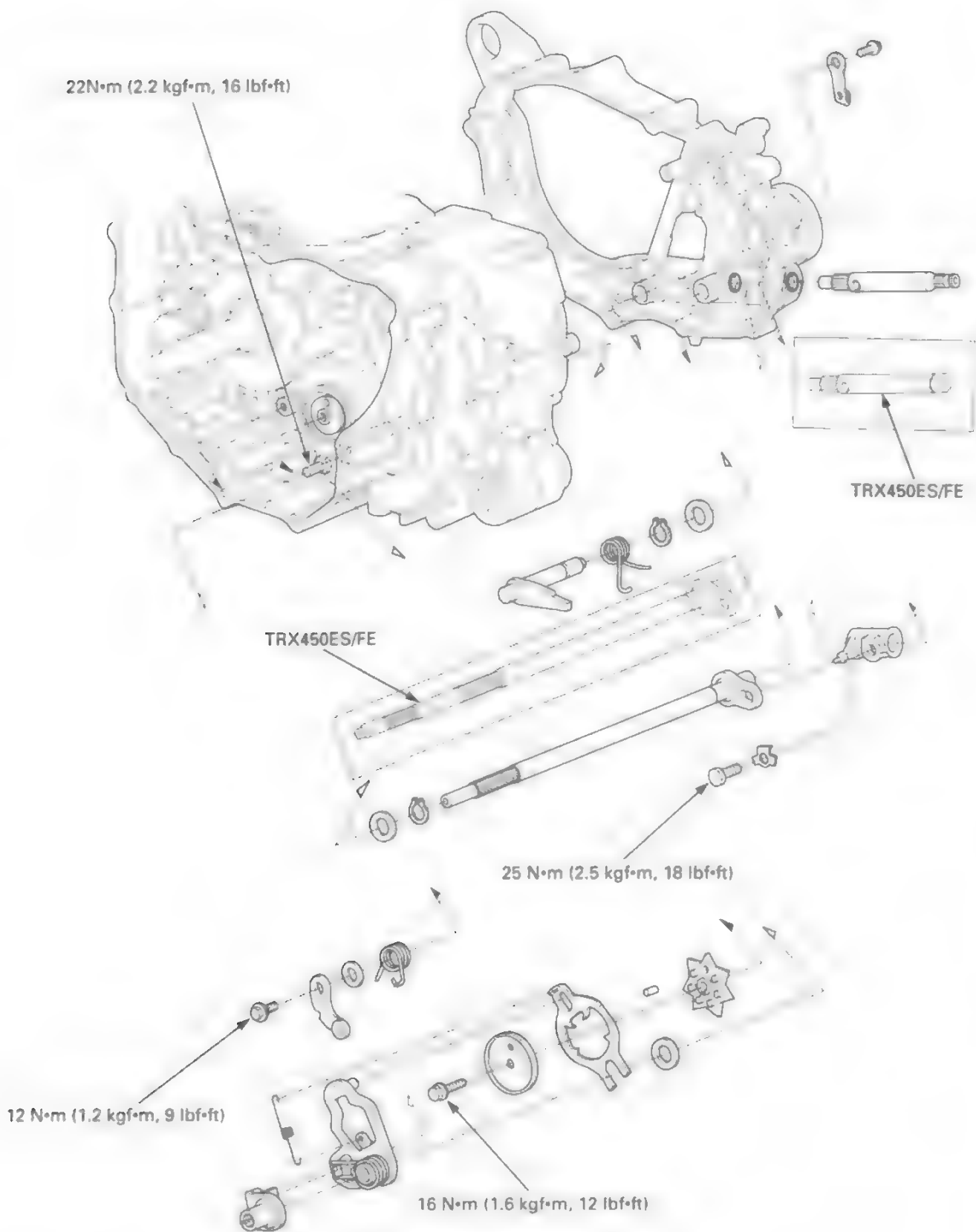
Pour recommended engine oil (page 3-10).  
Make sure there are no oil leaks.

Adjust the clutch (page 3-19).





## GEARSHIFT LINKAGE



# 9. GEARSHIFT LINKAGE

SERVICE INFORMATION	9-1	GEARSHIFT LINKAGE INSPECTION	9-4
TROUBLESHOOTING	9-1	GEARSHIFT LINKAGE INSTALLATION	9-4
GEARSHIFT LINKAGE REMOVAL	9-2	REVERSE STOPPER SHAFT	9-7

## SERVICE INFORMATION

### GENERAL

- This section covers removal and installation of the gearshift linkage.
- The engine must be removed from the frame before servicing the gearshift linkage except for gearshift plate mounting bolt adjustment.

### TORQUE VALUE

Drum shifter and guide plate bolt ('98 - '01)	12 N•m (1.2 kgf•m, 9 lbf•ft)	Apply locking to the threads.
(After '01)	16 N•m (1.6 kgf•m, 12 lbf•ft)	
Gearshift drum stopper arm bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)	
Gearshift return spring pin	22 N•m (2.2 kgf•m, 16 lbf•ft)	
Gearshift A arm bolt	25 N•m (2.5 kgf•m, 18 lbf•ft)	
Gearshift pedal bolt ('98 - '01)	16 N•m (1.6 kgf•m, 12 lbf•ft)	
(After '01)	20 N•m (2.0 kgf•m, 14 lbf•ft)	

## TROUBLESHOOTING

### Transmission jumps out of gear

- Shift drum stopper arm broken

### Gearshift pedal will not return

- Weak or broken shift return spring
- Shift spindle binding with case

### GEARSHIFT LINKAGE REMOVAL

Remove the following:

- Centrifugal clutch (page 8-4)
- Change clutch (page 8-12)

**TRX450S/FM:** Remove the gearshift pedal.

Remove the alternator cover (page 10-6).

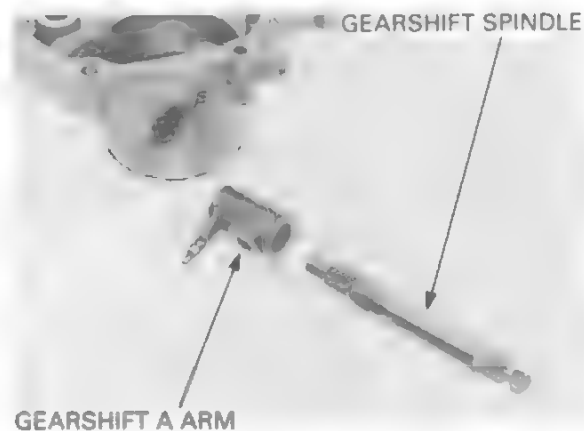


Bend down the tab of the lock washer of gearshift A arm.

Remove the bolt and lock washer.

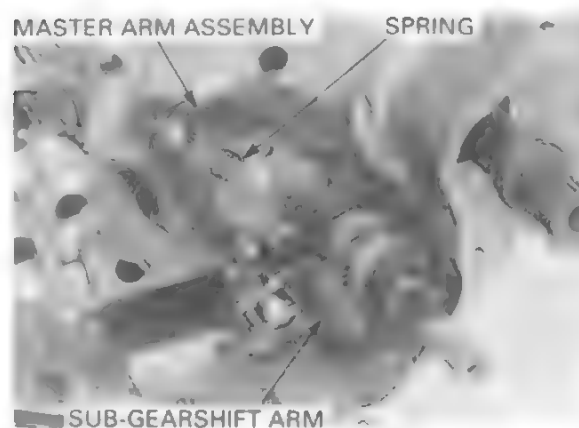


Remove the gearshift spindle and gearshift A arm.

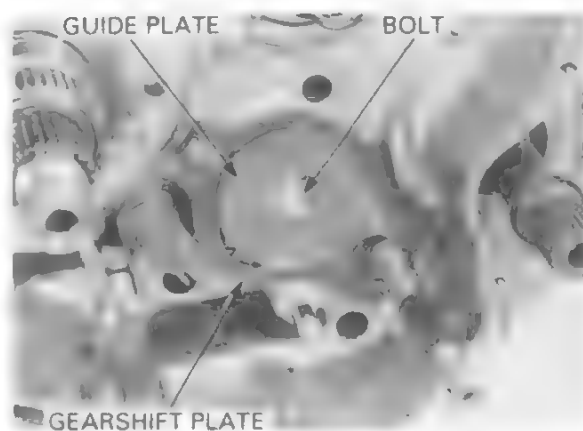


Remove the sub-gearshift arm.

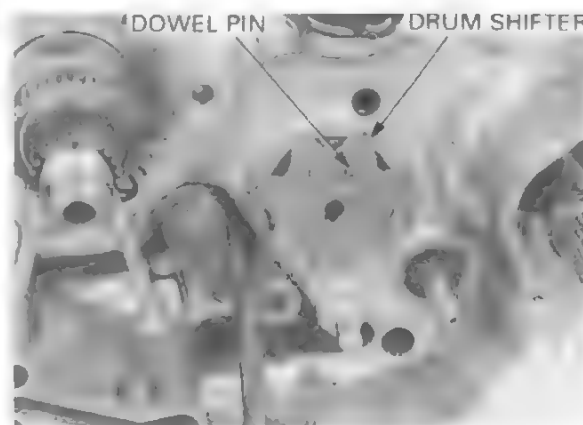
Unhook the shift arm spring from the gearshift plate.  
Remove the gearshift master arm assembly.



Remove the drum shifter and guide plate bolt.  
Remove the shift guide plate and gearshift plate.

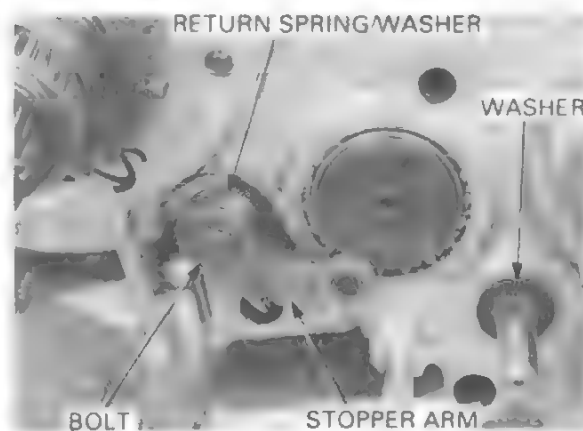


Remove the drum shifter while holding the stopper arm using a screwdriver.  
Remove the dowel pin.

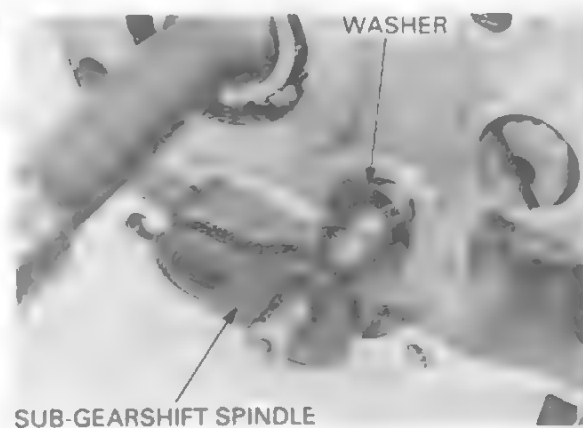


Remove the bolt, stopper arm, washer and return spring.

Remove the sub-gearshift spindle thrust washer.



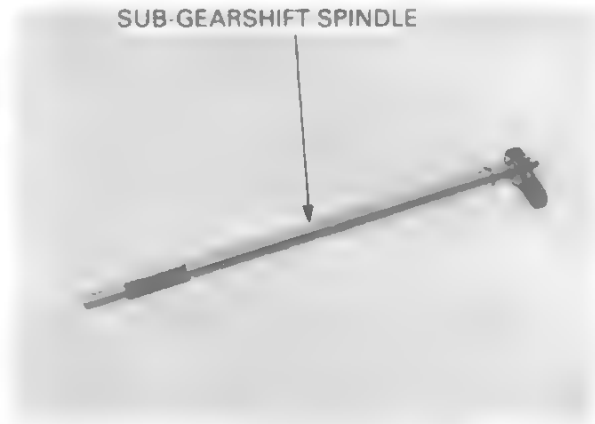
Remove the sub-gearshift spindle and thrust washer from the rear crankcase.



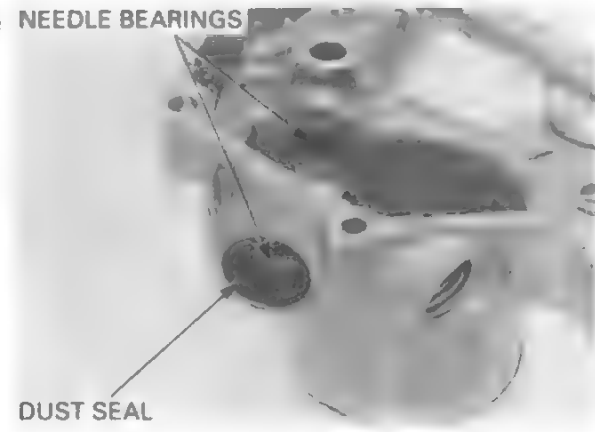
## GEARSHIFT LINKAGE

### GEARSHIFT LINKAGE INSPECTION

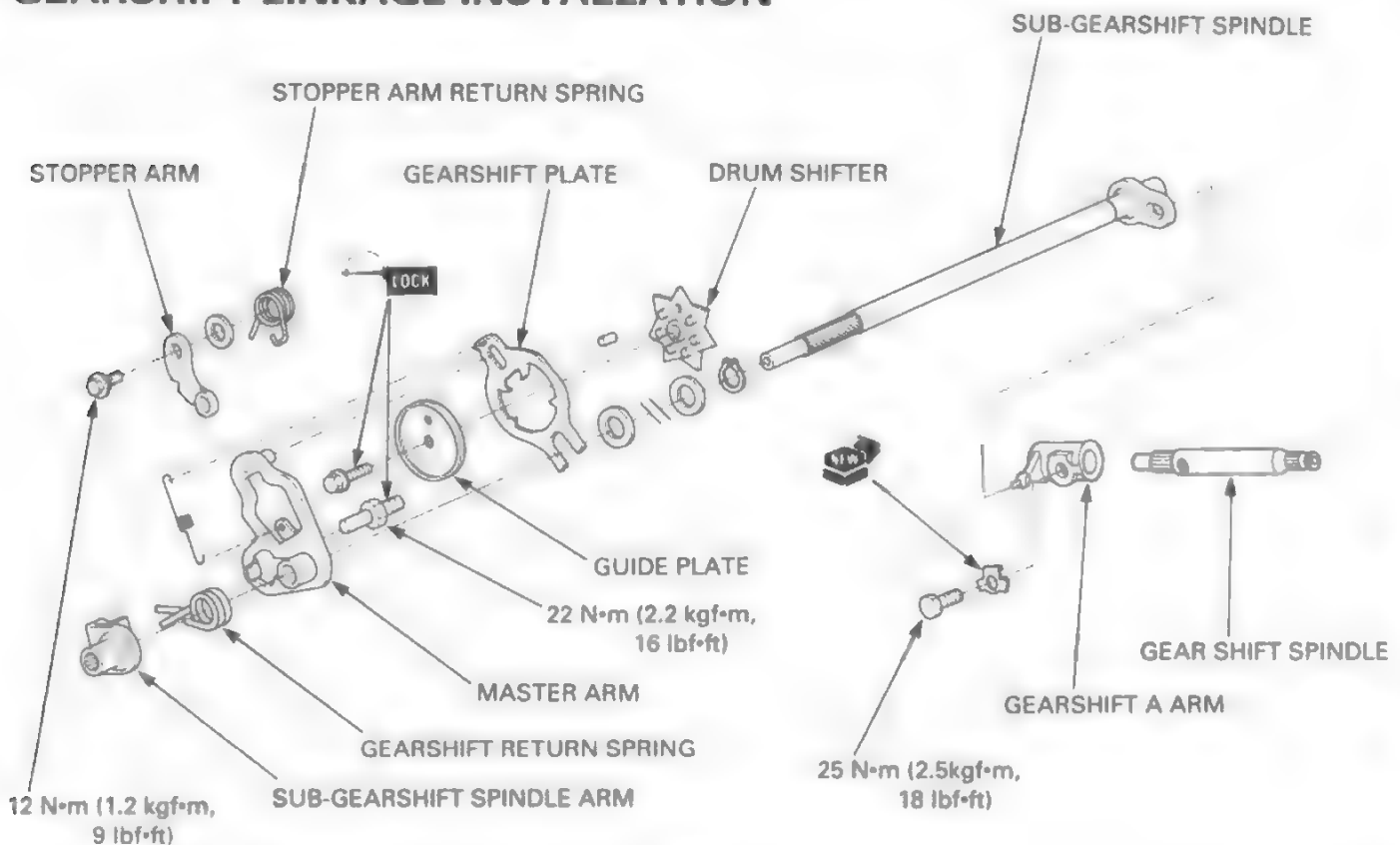
Inspect the sub-gearshift spindle for bends or other damage.



Inspect the gearshift spindle dust seal and needle bearings for wear or damage.



### GEARSHIFT LINKAGE INSTALLATION



Install the sub-gearshift spindle and thrust washer to the rear crankcase.

If reverse stopper arm was removed, it must be installed before sub-gearshift spindle (page 9-8).



Install the thrust washer onto the sub-gearshift spindle.

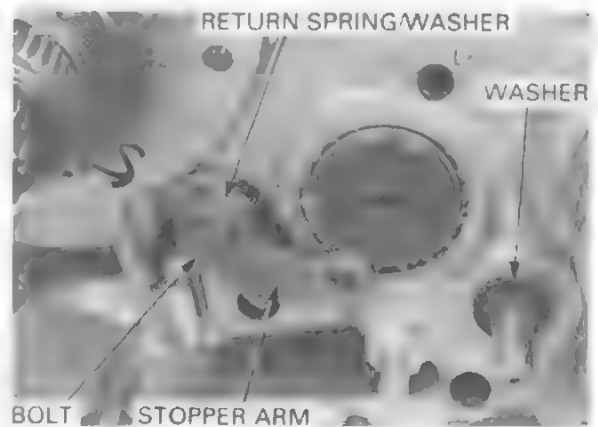
Install the return spring, washer and stopper arm into the crankcase so that arm lies below bearing edge.

Install and tighten the stopper arm bolt.

**TORQUE: 12 N-m (1.2 kgf-m, 9 lbf-ft)**

If the return spring pin was removed, apply a locking agent to the threads and install it.

**TORQUE: 22 N-m (2.2 kgf-m, 16 lbf-ft)**

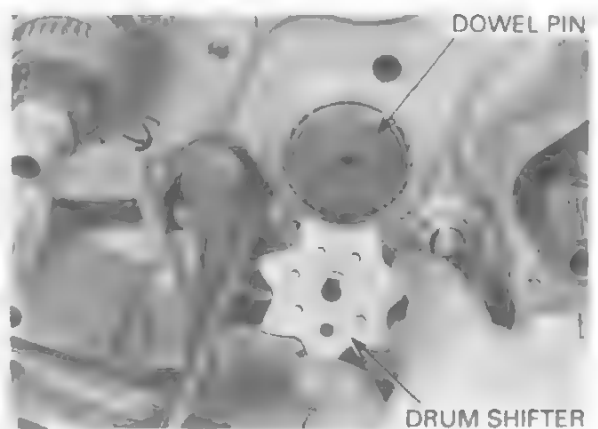


Install the dowel pin on the gearshift drum.

Install the drum shifter while holding the stopper arm using a screwdriver.

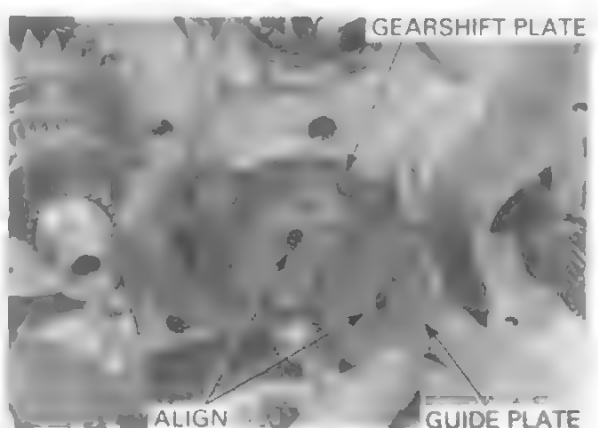
## NOTE:

The transmission is in neutral when the dowel pin is aligned with the index mark (boss) on the crankcase.



Install the gearshift plate.

Install the shift guide plate aligning the boss with the gearshift cam groove.



## GEARSHIFT LINKAGE

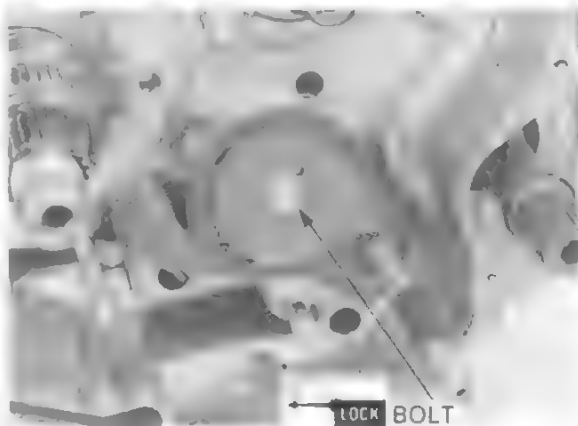
Apply locking agent to the drum shifter and guide plate bolt threads.  
Install and tighten the bolt to the specified torque.

### TORQUE:

'98 - '01: 12 N·m (1.2 kgf·m, 9 lbf·ft)

After '01: 16 N·m (1.6 kgf·m, 12 lbf·ft)

Align the hole in the plate with the index mark on the crankcase to place the transmission in neutral.

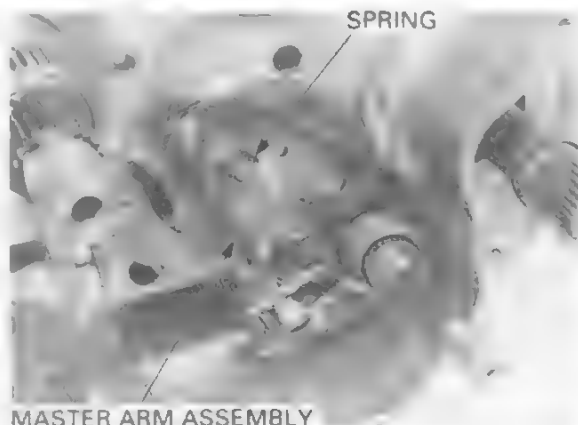


Install the gearshift master arm and return spring onto the sub-gearshift spindle.

### NOTE:

Install the master arm by aligning the return spring ends with the crankcase stopper pin.

Hook the shift arm spring between the master arm and gearshift arm.

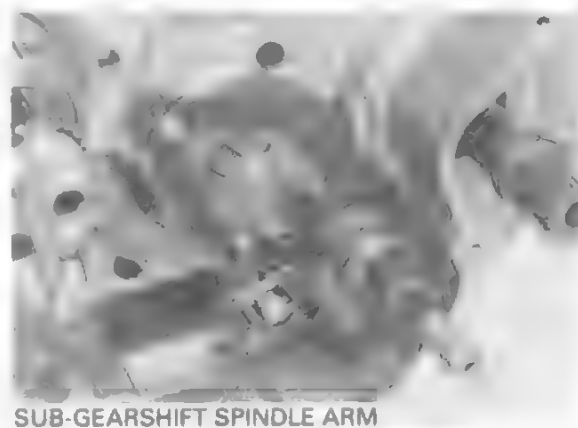


Install the sub-gearshift spindle arm onto the spindle.

### NOTE:

Align the wide splines between the arm boss and sub-gearshift spindle.

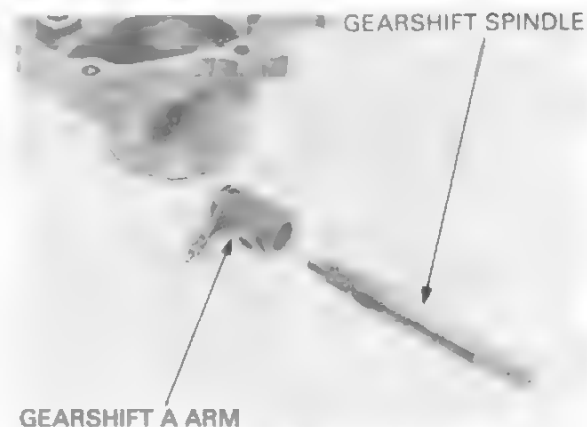
Install the clutch level (page 8-19).



Install the gearshift A arm into the alternator cover groove, then install the gearshift spindle.

### NOTE:

Align the wide splines between the gearshift arm A and spindle.



Install the new lock washer and bolt, then tighten the bolt to the specified torque.

**TORQUE:** 25 N·m (2.5 kgf·m, 18 lbf·ft)

Bend the tab of the lock washer against the bolt.

Install the following

- Rear crankcase cover (page 10-12)
- Flywheel / starter clutch (page 10-13)
- Alternator cover (page 10-14)



**TRX450S/FM:** Install the gearshift pedal onto the gearshift spindle by aligning the punch marks. Tighten the bolt to the specified torque.

**TORQUE:** '98 - '01: 16 N·m (1.6 kgf·m, 12 lbf·ft)  
After '01: 20 N·m (2.0 kgf·m, 14 lbf·ft)

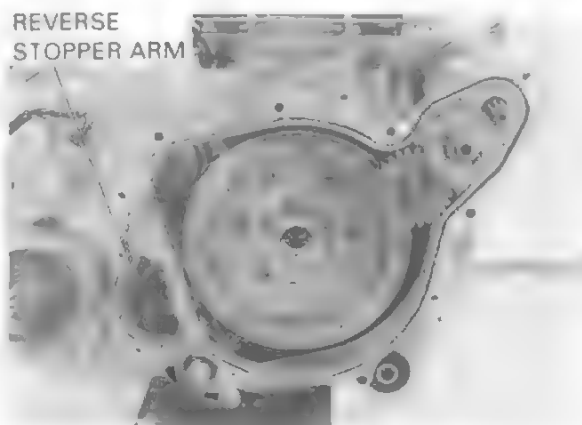
Install the removed parts in the reverse order of removal.



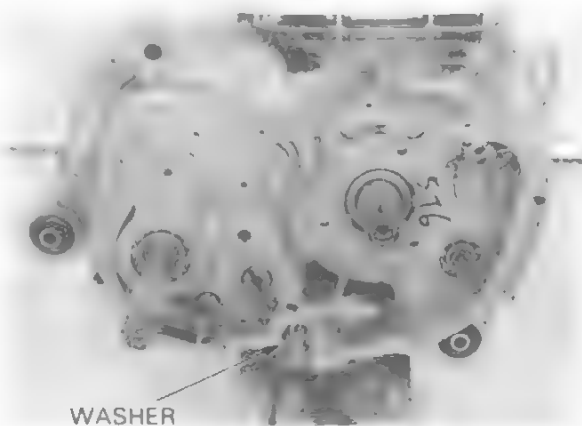
## REVERSE STOPPER SHAFT

### REMOVAL

Remove the bolt and reverse stopper arm.  
Remove the rear crankcase cover (page 10-9).



Remove the washer from the reverse stopper shaft.





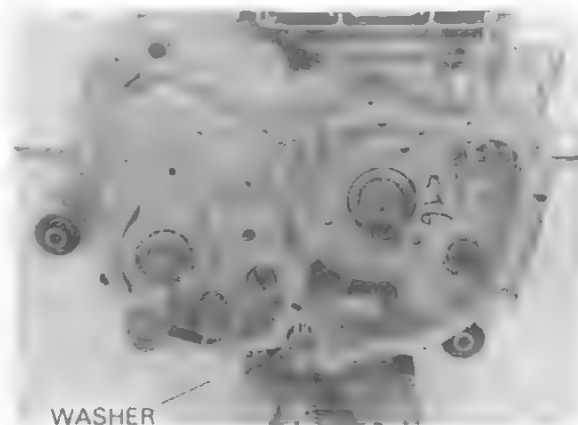
## GEARSHIFT LINKAGE

Pull out the reverse stopper shaft while holding the reverse arm using a screwdriver.

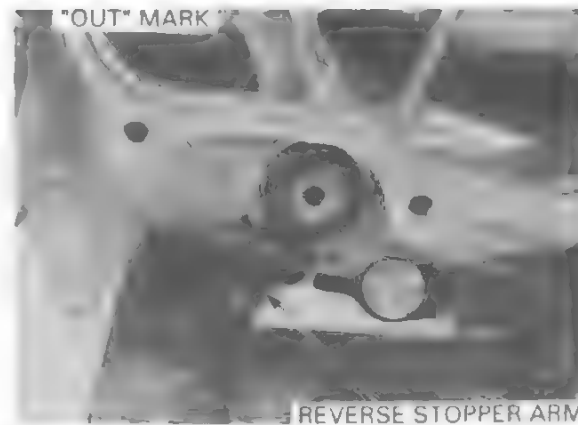
Install the reverse stopper arm shaft in the reverse order of removal.



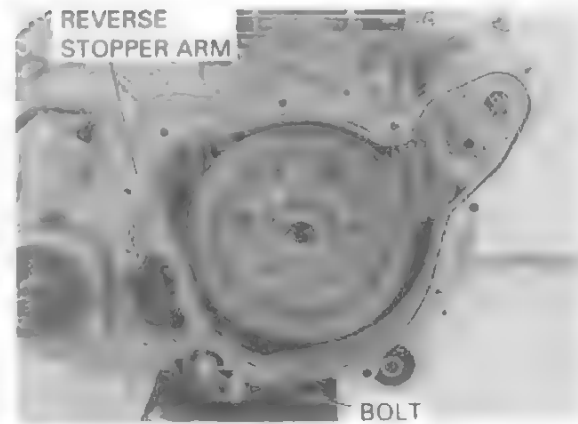
Install the thrust washer onto the reverse stopper shaft.  
Install the rear crankcase cover (page 10-12).



Install the reverse stopper arm with its "OUT" mark facing out.



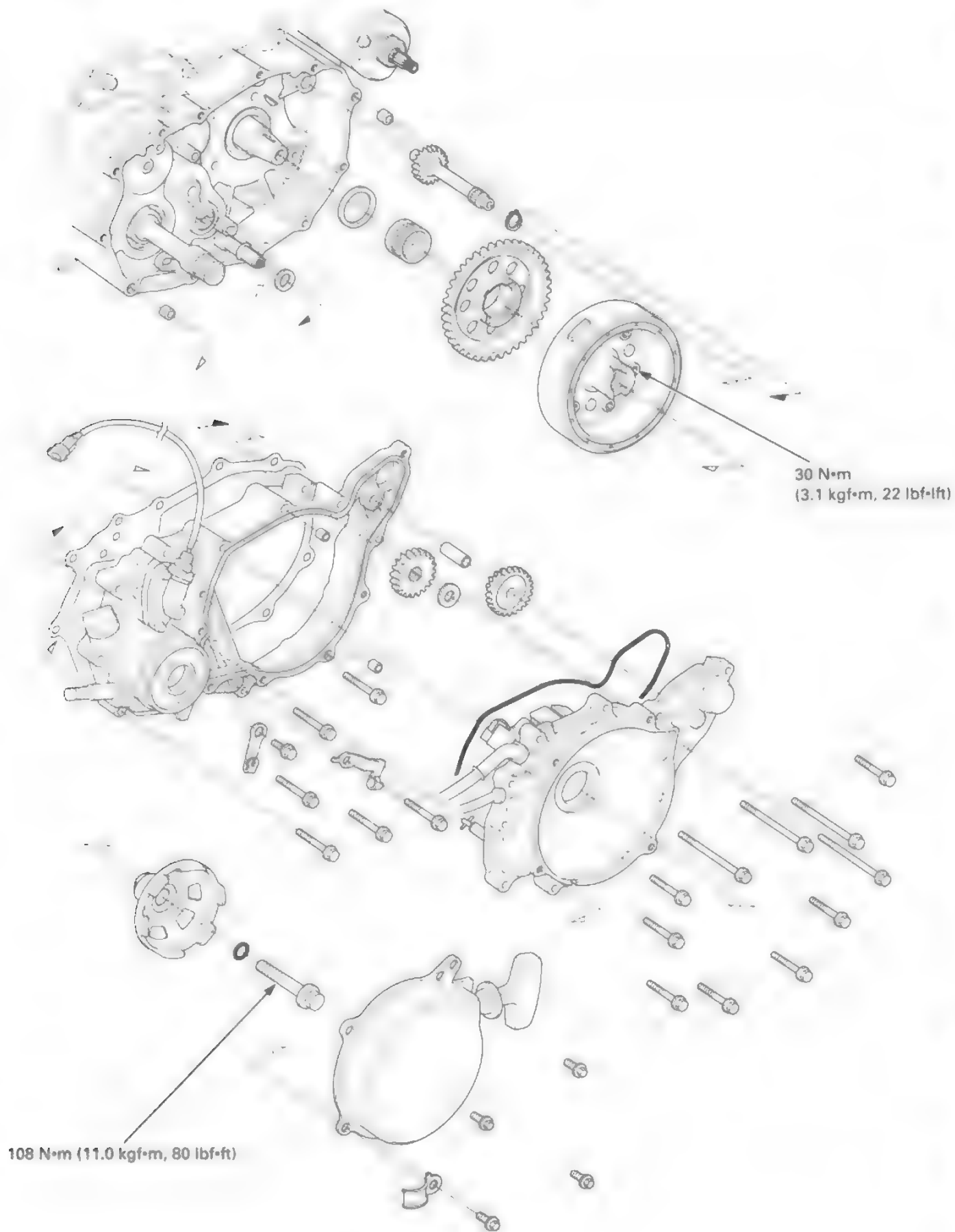
Install and tighten the reverse stopper arm bolt securely.  
Install the alternator cover (page 10-14).



---

MEMO

## ALTERNATOR/STARTER CLUTCH



# 10. ALTERNATOR/STARTER CLUTCH

SERVICE INFORMATION	10-1	ALTERNATOR REMOVAL	10-6
TROUBLESHOOTING	10-1	FLYWHEEL/STARTER CLUTCH	10-9
RECOIL STARTER	10-2	ALTERNATOR INSTALLATION	10-14

## SERVICE INFORMATION

### GENERAL

- This section covers removal and installation of the starter reduction gear, alternator, ignition pulse generator, flywheel and starter clutch.
- Refer to section 17 for alternator inspection, and to section 18 for ignition pulse generator inspection.
- These parts can be serviced with the engine in the frame.

### TORQUE VALUES

Recoil pulley flange bolt	110 N•m (11.0 kgf•m, 80 lbf•ft)	Apply oil to the thread and flange surface.
Starter one-way clutch socket bolt	30 N•m (3.1 kgf•m, 22 lbf•ft)	Apply locking agent to the threads.
Stator socket bolt	10 N•m (1.0 kgf•m, 7 lbf•ft)	
Ignition pulse generator socket bolt	6 N•m (0.6 kgf•m, 4.3 lbf•ft)	Apply locking agent to the threads.

### TOOLS

Recoil pulley holder	07SMB-HM70100
Rotor puller	07733-0020001 or 07933-3950000 (U.S.A. only)
Flywheel holder	07725-0040000 or equivalent commercially available in U.S.A.
Driver	07749-0010000
Attachment, 24 X 26 mm	07746-0010700
Attachment, 52 X 55 mm	07746-0010400
Attachment, 58 mm	07JAD-PH80101
Pilot, 10 mm	07746-0040100

## TROUBLESHOOTING

### Engine does not turn

- Faulty one-way starter clutch
- Starter reduction gear broken

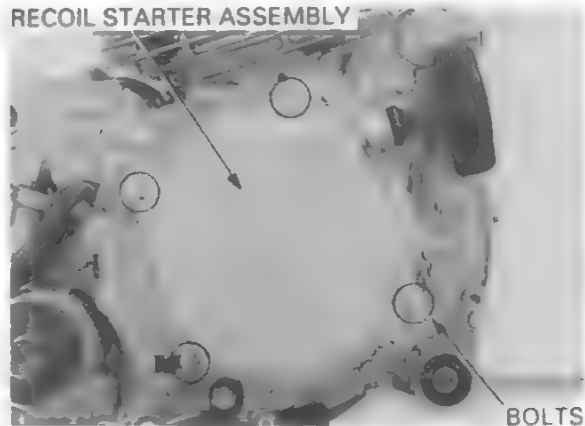
## RECOIL STARTER

### REMOVAL

Remove the breather tube clamps from the recoil starter cover.

Remove the bolts and recoil starter assembly.

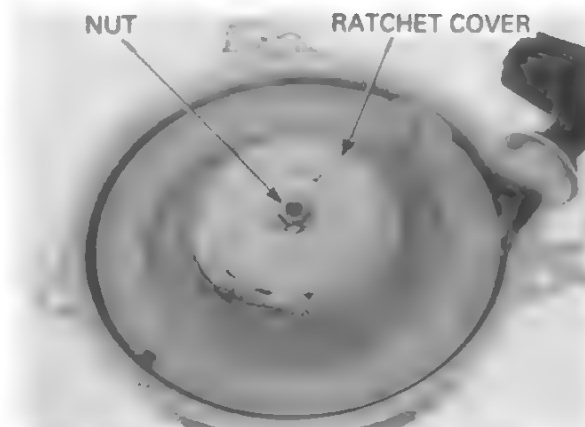
RECOIL STARTER ASSEMBLY



BOLTS

### DISASSEMBLY

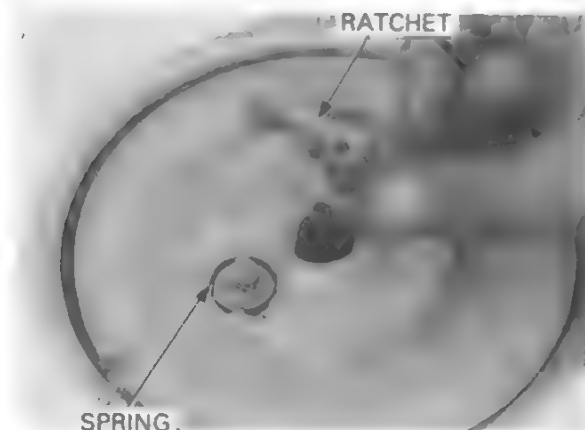
Remove the nut and the ratchet cover.



NUT

RATCHET COVER

Remove the ratchet and spring.  
Check each part for wear or damage.



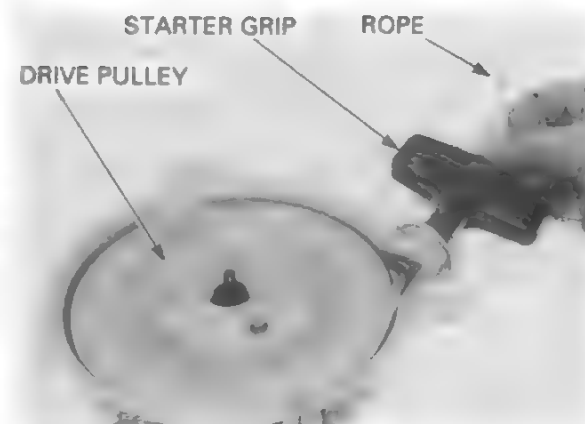
RATCHET

SPRING

Untie the starter rope and remove the starter grip.  
Release the starter rope slowly.  
Remove the starter drive pulley.

### CAUTION:

*Wear eye protection and use care when removing the drive pulley and starter spring. The spring can pop out of the housing if care is not used.*

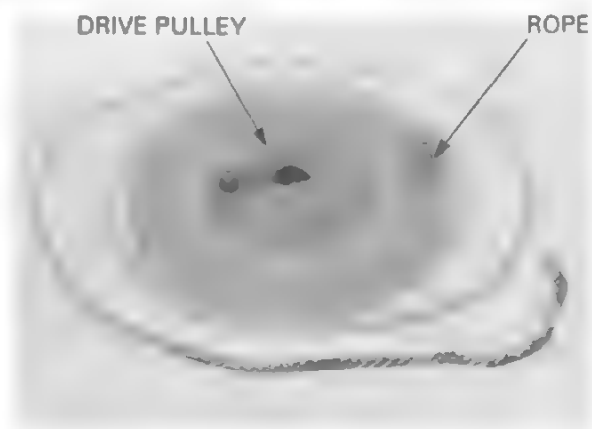


STARTER GRIP

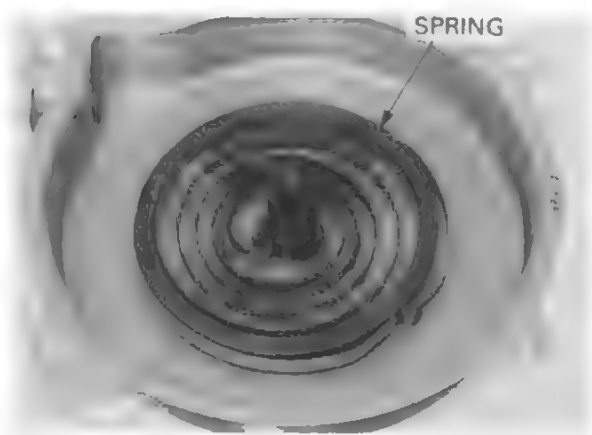
ROPE

DRIVE PULLEY

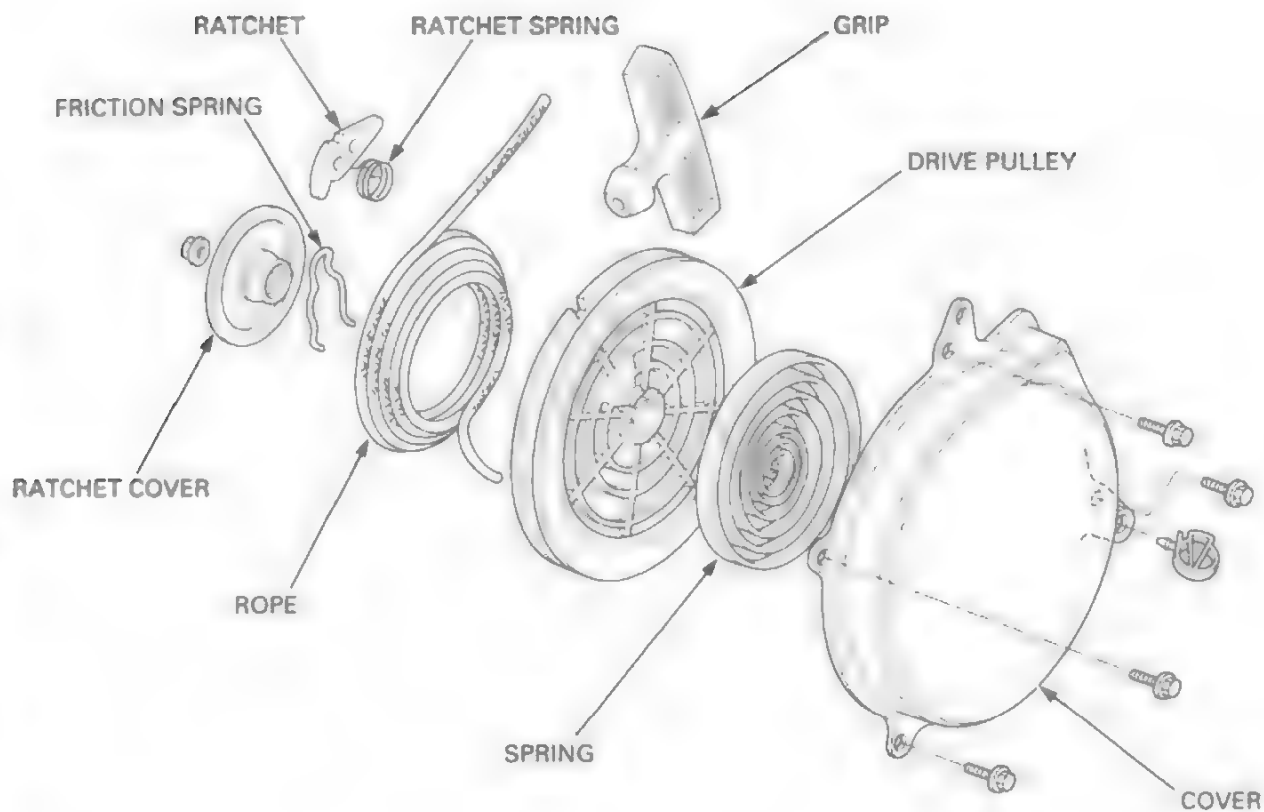
Remove the starter rope from the drive pulley.  
Check the starter rope for wear or damage.



Check the recoil starter spring.  
Remove the spring and replace it if it is broken.

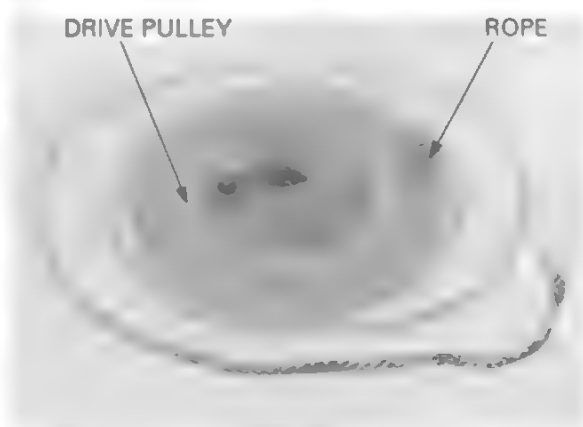


### ASSEMBLY



## ALTERNATOR/STARTER CLUTCH

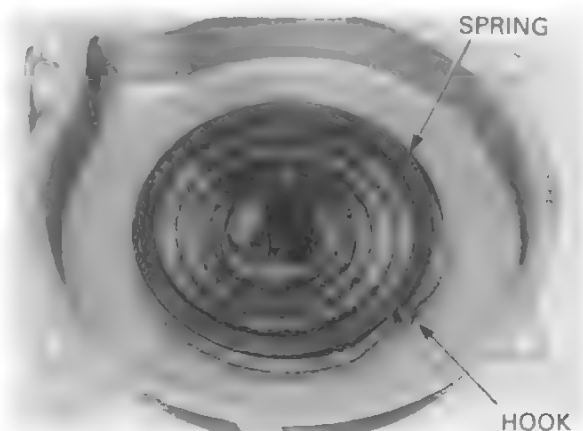
Install the starter rope and tie a square knot as shown.  
Wrap the rope around the starter pulley in a counter clockwise direction as viewed from the ratchet side as shown.



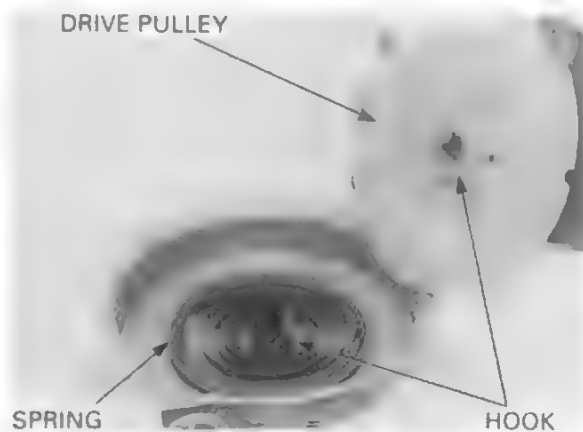
Install the spring by hooking the end on the starter housing hook.

### CAUTION:

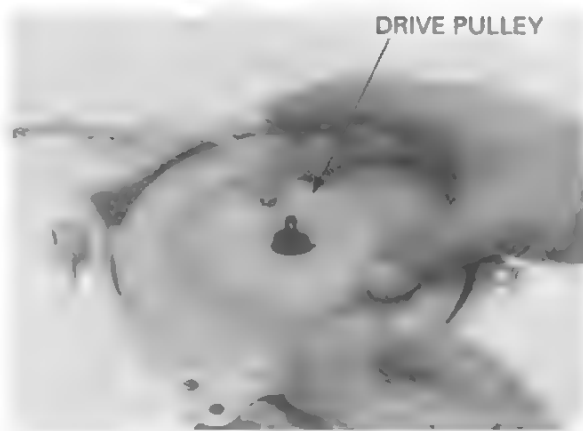
*Wear eye protection and use care when installing the starter spring. The spring can pop out of the housing if care is not used.*



Grease the drive pulley shaft and install the pulley by hooking the end of the spring on the pulley shaft.

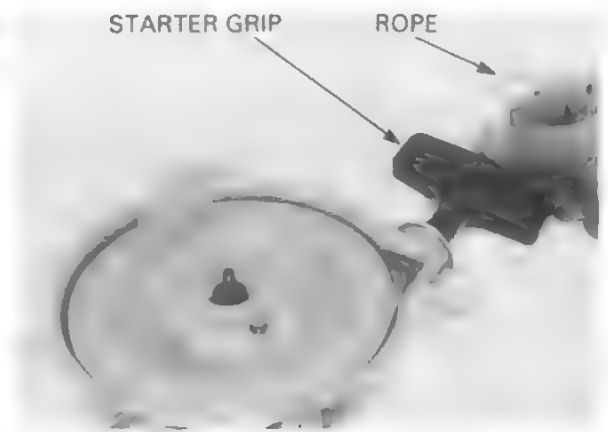


Reload the starter spring by turning the pulley 2-1/2 turns clockwise.

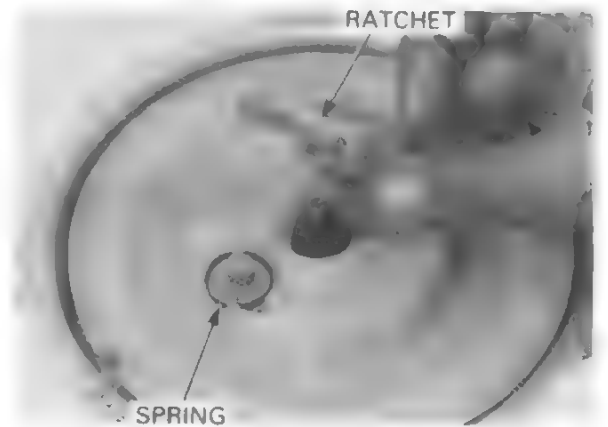


Route the rope end through the starter housing hole and install the grip.

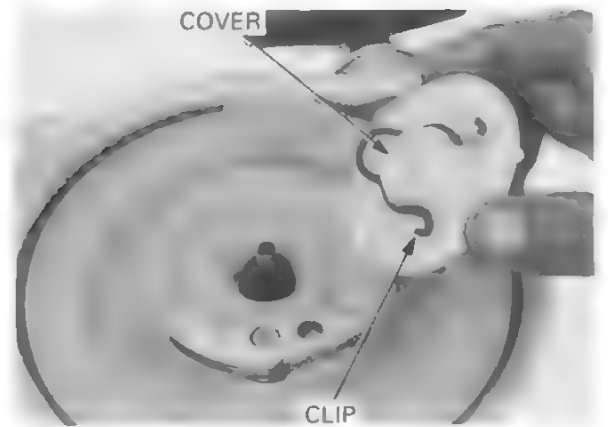
Tie the rope end in a square knot.



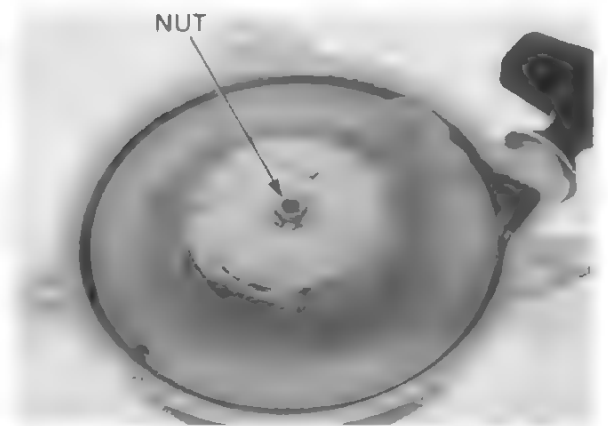
Grease the ratchet and install it with the spring.



Install the clip to the ratchet cover.



Install the ratchet cover and tighten the nut.  
Check the starter operation by pulling the starter grip.





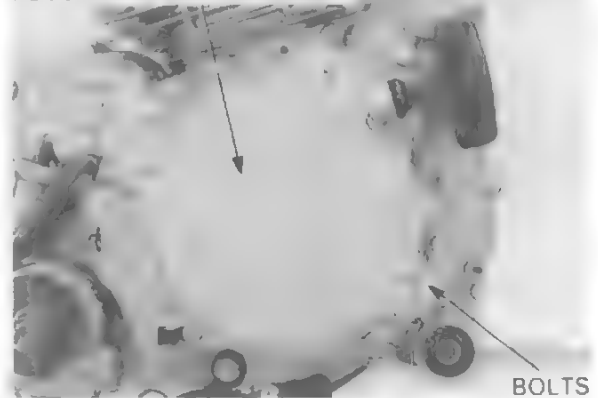
## ALTERNATOR/STARTER CLUTCH

### INSTALLATION

Install the recoil starter assembly and tighten the bolts.

Route the wires and secure them with the clamps.

RECOIL STARTER ASSEMBLY



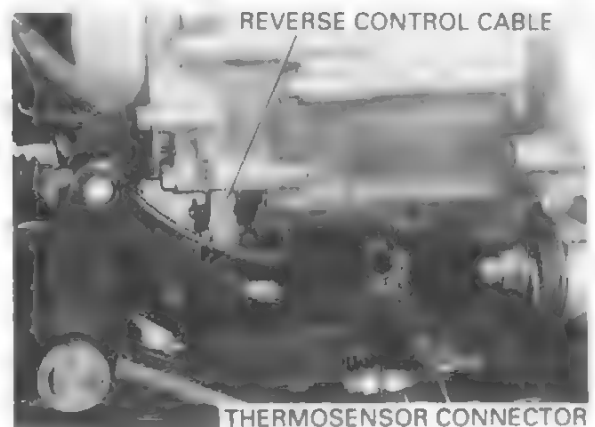
## ALTERNATOR REMOVAL

### ALTERNATOR COVER REMOVAL

Remove the recoil starter (page 10-2).

Disconnect the thermosensor connector from the sensor.

Disconnect the reverse control cable end from the lever.

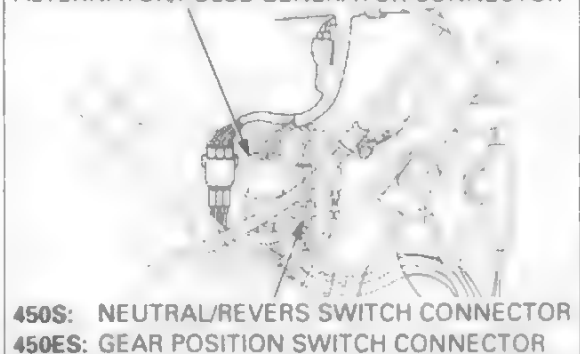


**TRX450S/FM:** Disconnect the neutral/reverse switch and alternator/pulse generator connectors.

**TRX450ES/FE:** Disconnect the gear position switch and alternator/pulse generator connectors.

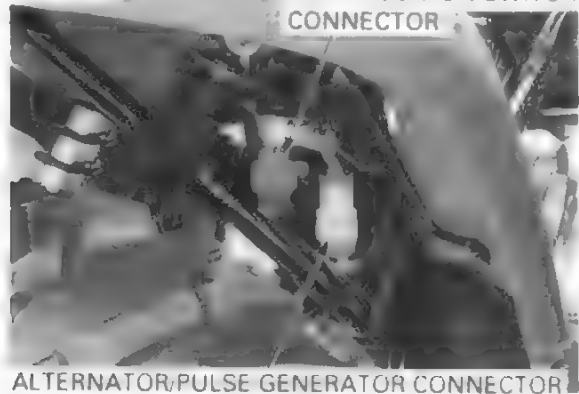
'98-'01:

ALTERNATOR/PULSE GENERATOR CONNECTOR



After '01:

GEAR POSITION SWITCH  
CONNECTOR



Hold the starter driven pulley using the special tool, then remove the bolt and O-ring.

**TOOL:**

Recoil pulley holder

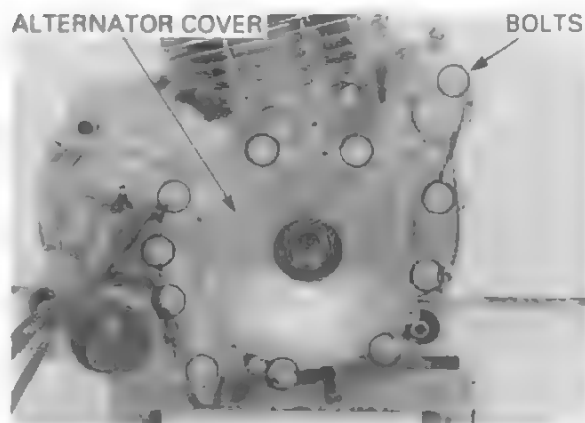
07SMB-HM70100



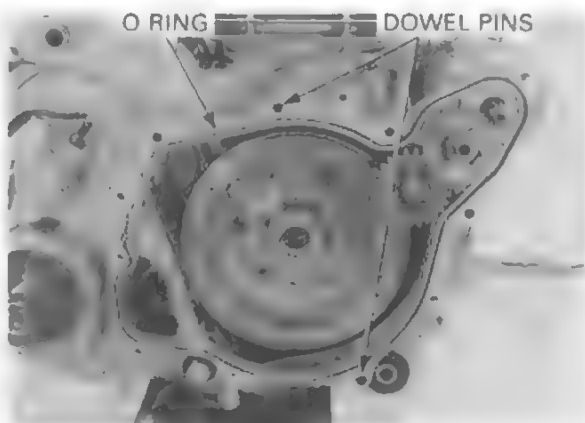
Remove the eleven bolts and alternator cover.

**NOTE:**

The starter reduction gears may fall out as the cover is removed.



Remove the O-ring and dowel pins.



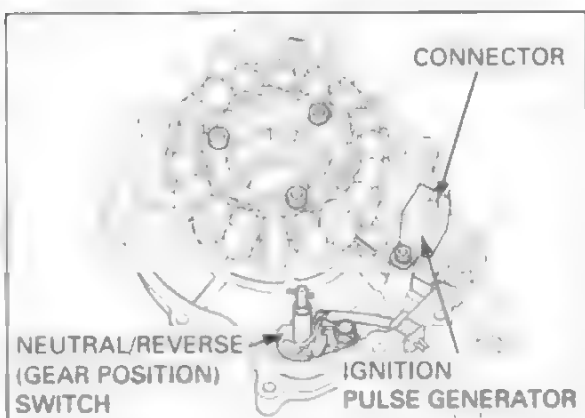
## ALTERNATOR COVER DISASSEMBLY

Disconnect the ignition pulse generator connector. Remove the wire grommet from the alternator cover groove.

Remove the ignition pulse generator and stator mounting bolts.

Remove the stator/ignition pulse generator assembly.

Remove the bolt and neutral/reverse (gear position) switch.



## ALTERNATOR/STARTER CLUTCH

Turn the starter bearing inner race with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the alternator cover.

If you need to replace the bearing, heat the alternator cover and remove the bearing by tapping the cover.

### **⚠ WARNING**

*Always wear gloves when handling the case after it has been heated to prevent burning your hands.*

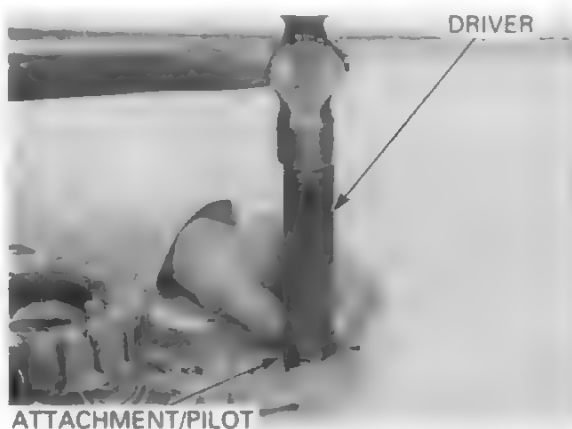
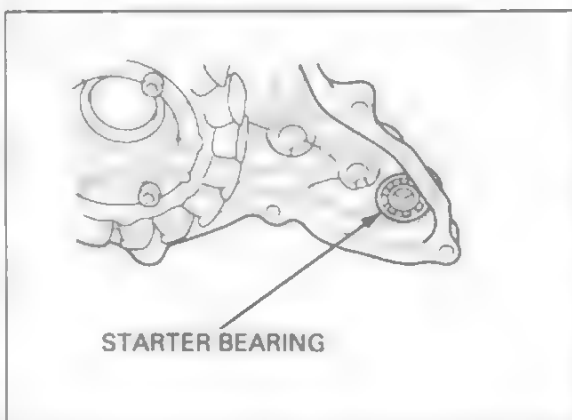
### **CAUTION:**

*Do not use a torch to heat the case, it may cause warping.*

Drive the new bearing into the alternator cover.

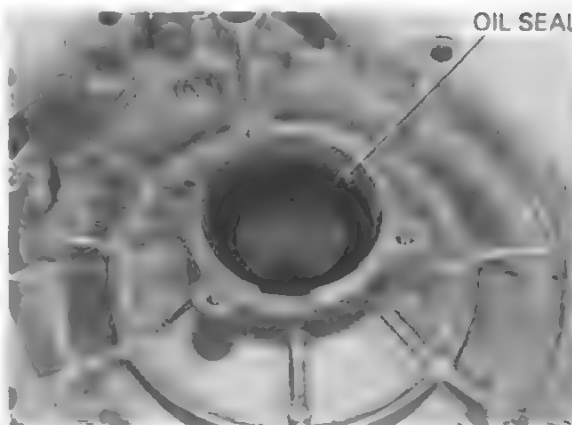
### **TOOLS:**

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 24 X 26 mm</b>	<b>07746-0010700</b>
<b>Pilot, 10 mm</b>	<b>07746-0040100</b>



Inspect the alternator cover oil seal for wear or damage.

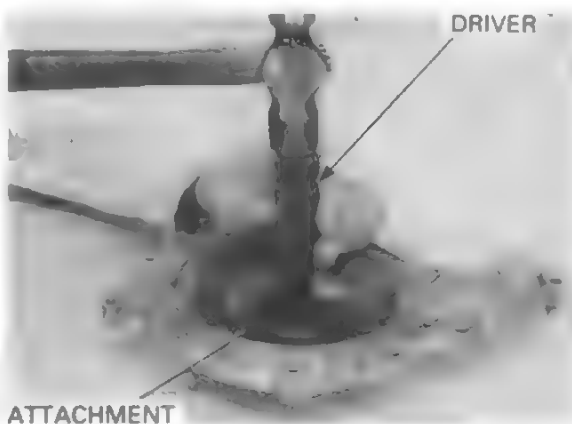
If replacement is required, remove the oil seal from the alternator cover.



Install the oil seal using the special tools as shown.

### **TOOLS:**

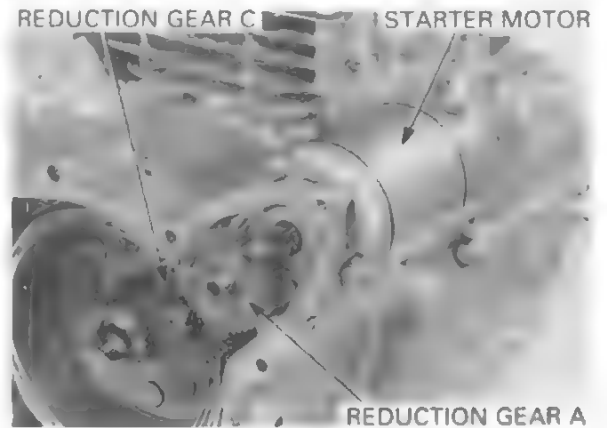
<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 52 X 55 mm</b>	<b>07746-0010400</b>



## FLYWHEEL/STARTER CLUTCH

### FLYWHEEL/STARTER CLUTCH REMOVAL

Remove the starter reduction gear A and shaft.  
Remove the washer and reduction gear C.  
Remove the starter motor (page 19-3).



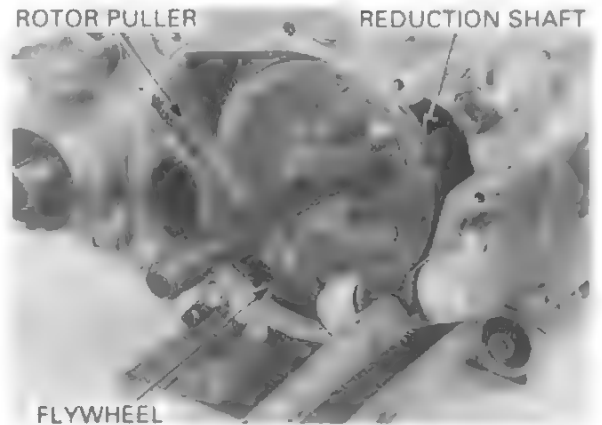
Remove the flywheel and starter driven gear using the special tool.

#### TOOL:

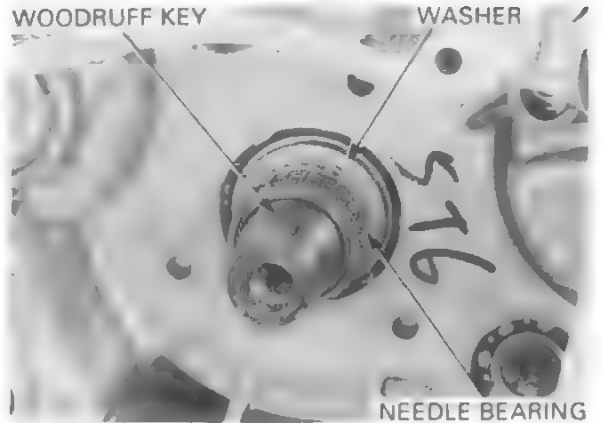
Rotor puller

07733-0020001 or  
07933-3950000  
(U.S.A. only)

Remove the starter reduction shaft.



Remove the needle bearing, washer and woodruff key.

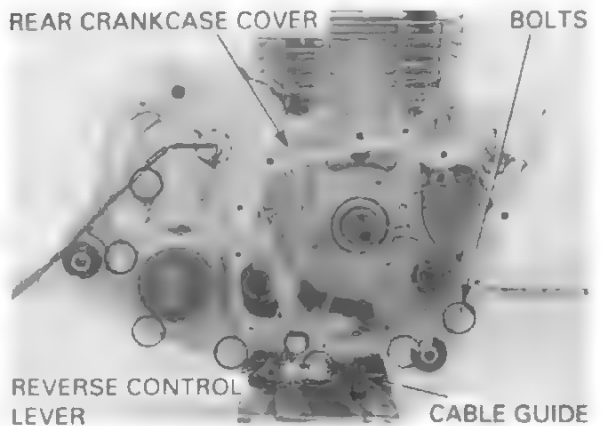


### REAR CRANKCASE COVER REMOVAL

98 - '01. Remove the speed sensor (page 20-12).

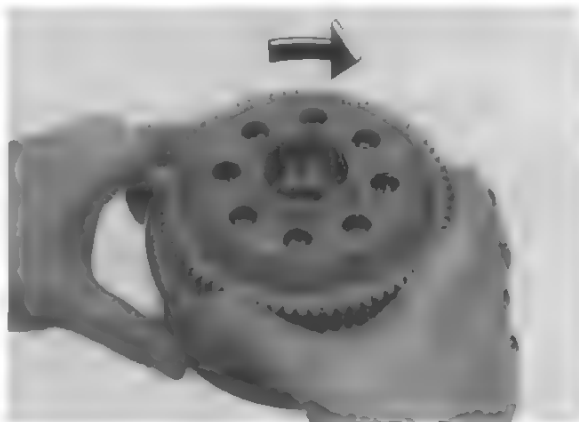
Remove the bolt and reverse control lever.

Remove the bolts, cable guide and rear crankcase cover.

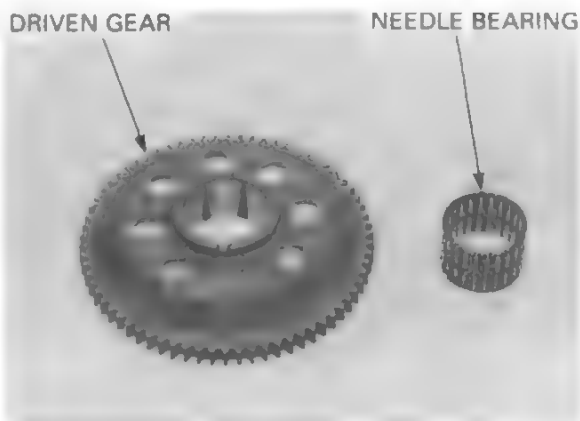


### STARTER CLUTCH INSPECTION/ DISASSEMBLY

Check the operation of the one-way clutch by turning the driven gear.  
You should be able to turn the driven gear clockwise smoothly, but the gear should not turn counter-clockwise.



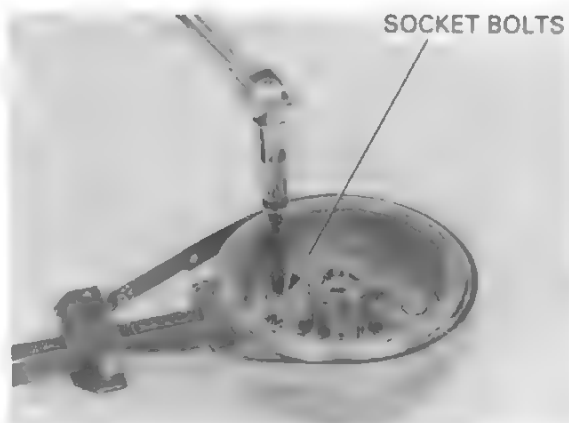
Inspect the starter driven gear teeth for damage or abnormal wear.  
Check the needle bearing for damage.



Remove the six socket bolts and remove the one-way clutch from the flywheel.

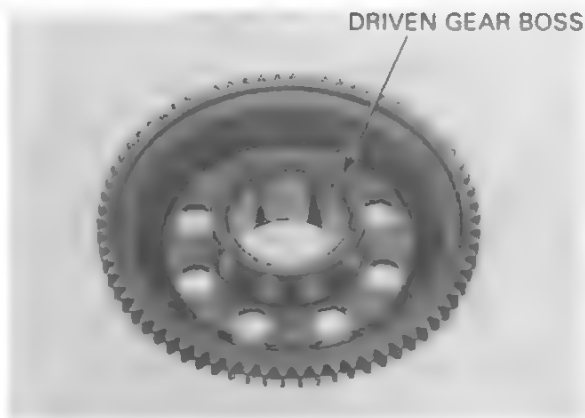
**TOOL:**  
Flywheel holder

07725-0040000 or  
equivalent commercially  
available in U.S.A.

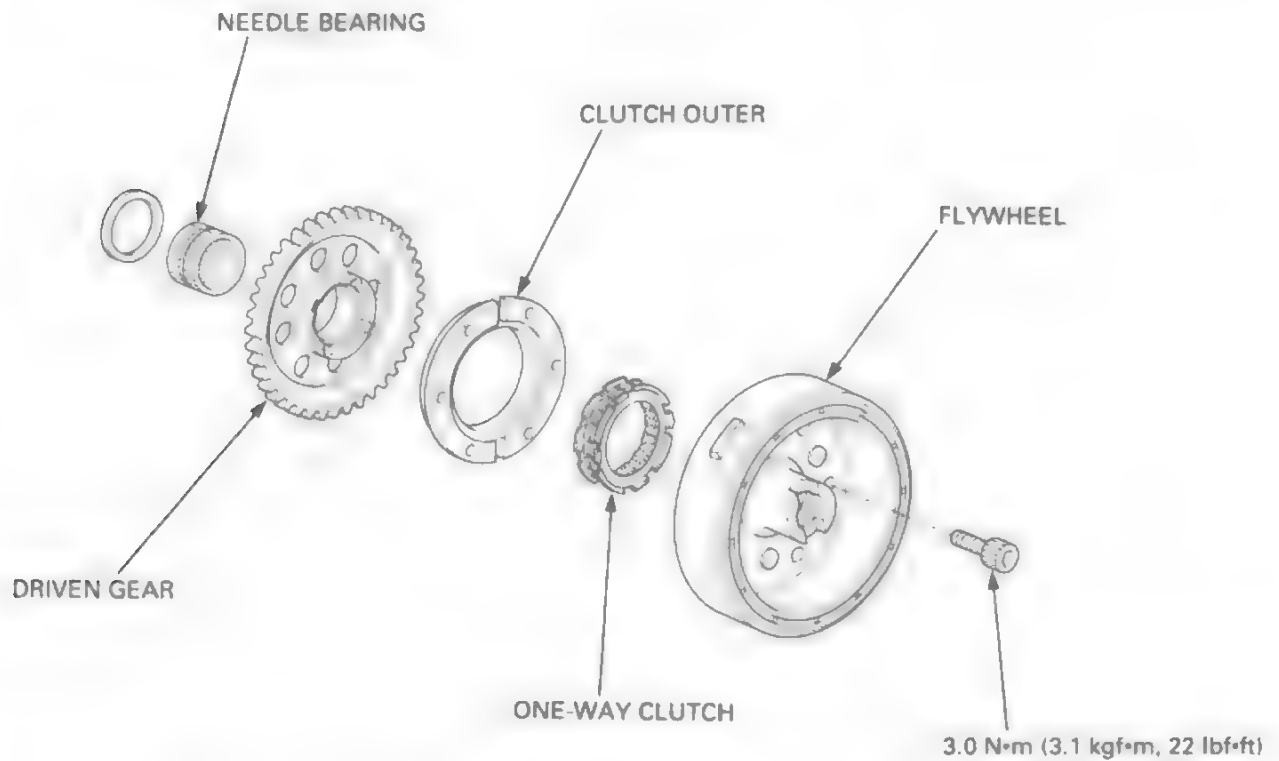


Check the one-way clutch rollers for wear or damage.

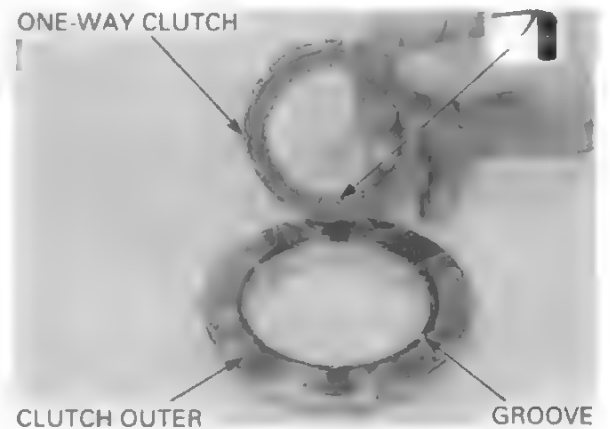
Check the starter driven gear boss for wear or damage.



# STARTER CLUTCH ASSEMBLY



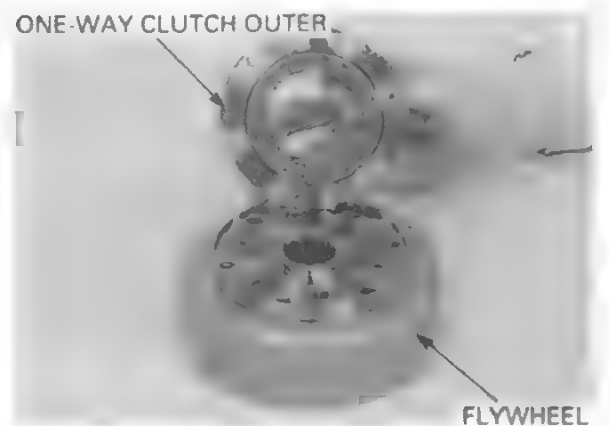
Apply oil to one-way clutch rollers.  
Install the one-way clutch in the clutch outer.  
Install the lips of the clutch into the groove of the  
clutch outer as shown.



Assemble the one-way clutch outer and the flywheel.

## NOTE:

Make sure the flange side of the one-way clutch  
faces toward the flywheel.



## ALTERNATOR/STARTER CLUTCH

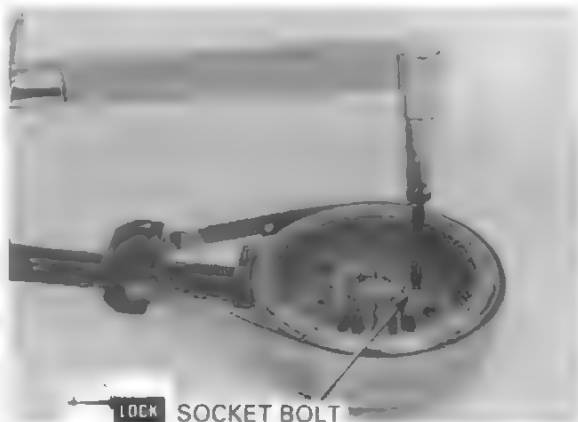
Apply a locking agent to the threads of the socket bolt threads.  
Hold the flywheel using the special tool and install and tighten the six socket bolts.

**TORQUE:** 30 N·m (3.1 kgf·m, 22 lbf·ft)

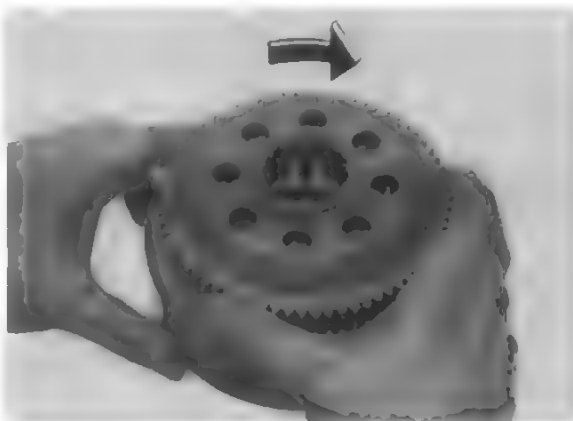
**TOOL:**

**Flywheel holder**

**07725-0040000 or  
equivalent commercially  
available in U.S.A.**



Install the starter driven gear into the one-way clutch by turning it clockwise.



## DRIVE SHAFT OIL SEAL REPLACEMENT

*Use the back side  
of the oil seal driver.*

Remove the clip and oil seal.

Drive new oil seal into the rear crankcase cover using the special tools.

**TOOLS:**

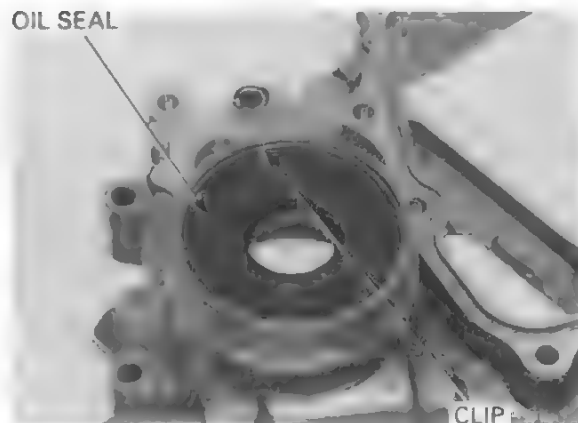
**Driver**

**07749-0010000**

**Attachment, 58 mm**

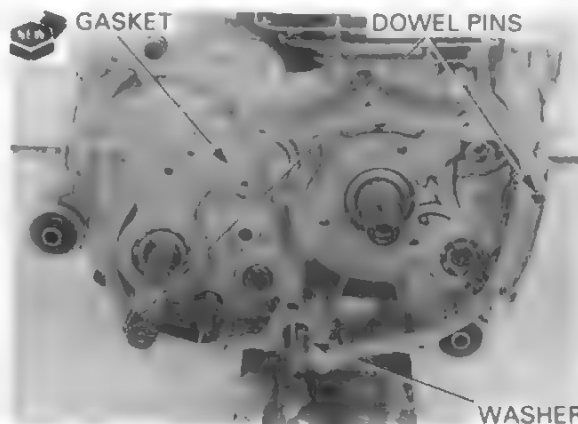
**07JAD-PH80101**

Install the oil seal clip.



## REAR CRANKCASE COVER INSTALLATION

Install the dowel pins, washer and new gasket.



Install the rear crankcase cover, reverse control cable guide and bolts.  
Tighten the bolts in a crisscross pattern in two or three steps.

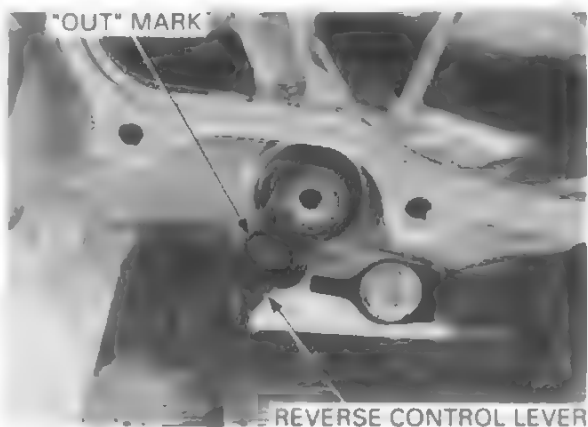
98 - 01 Install the speed sensor (page 20-12).

## NOTE:

- Align the gearshift A-arm with the sub-gearshift spindle as you install the cover.
- Make sure the washer is installed on the reverse spindle.



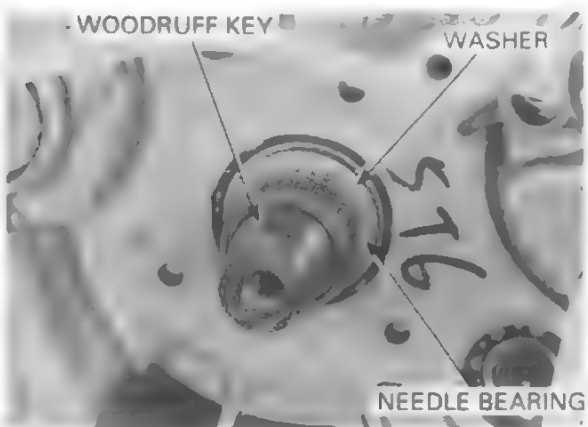
Install the reverse stopper arm with its "OUT" mark facing out, then tighten the reverse stopper shaft bolts.



## FLYWHEEL/STARTER CLUTCH INSTALLATION

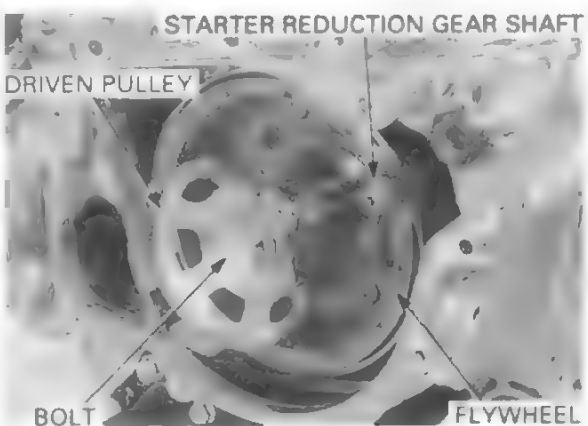
Clean any oil from the crankshaft taper.  
Install the washer.

Install the needle bearing onto the crankshaft.  
Install the woodruff key.



Make sure the starter reduction gear shaft is installed.  
Install the flywheel/starter reduction gear aligning the key in the flywheel with the key on the crankshaft.

For installation of the alternator cover, temporarily install the driven pulley and tighten the driven pulley bolt to seat the flywheel.

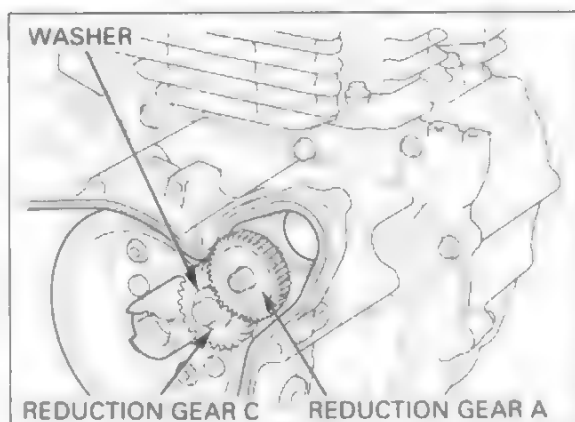




## ALTERNATOR/STARTER CLUTCH

Install the starter reduction gear C and thrust washer. Install the starter reduction shaft and reduction gear A.

Install the alternator cover (see below).



## ALTERNATOR INSTALLATION

### ALTERNATOR ASSEMBLY

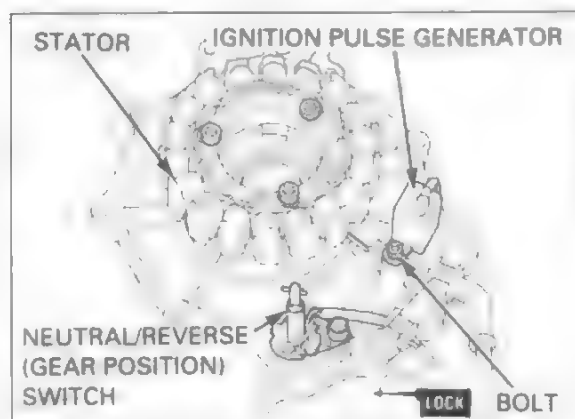
Apply sealant to the grommets of the alternator/ignition pulse generator and neutral/reverse (gear position) switch wire grommets.

Install the neutral/reverse (gear position) switch and alternator/ignition pulse generator assembly onto the alternator cover.

Route the wires properly as shown and install the grommets into the groove of the alternator cover.

Apply a locking agent to the neutral/reverse (gear position) switch mounting bolt threads.

Install the neutral/reverse (gear position) switch and tighten the bolt.



**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

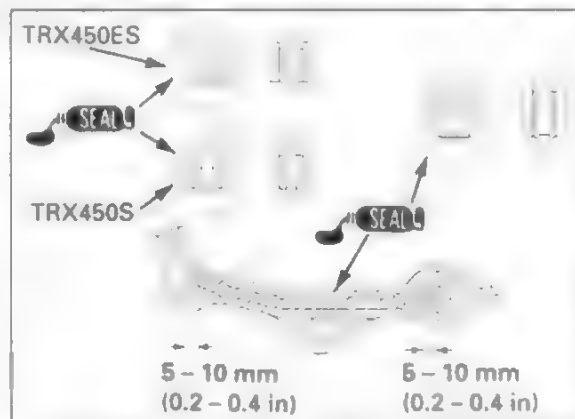
Install and tighten the stator mounting bolts.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Install and tighten the ignition pulse generator mounting bolts.

**TORQUE: 6 N·m (0.6 kgf·m, 4.3 lbf·ft)**

Connect the ignition pulse generator connector.

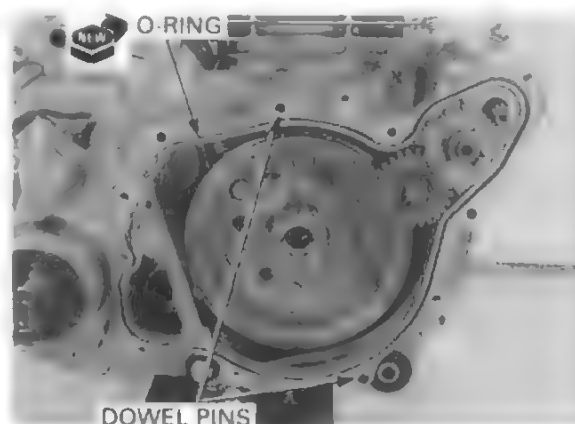


### ALTERNATOR COVER INSTALLATION

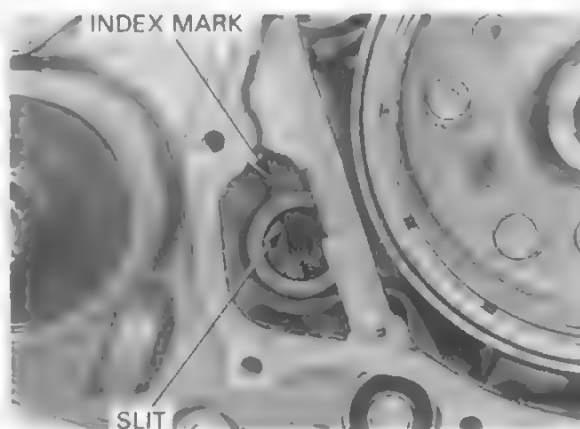
Install the new O-ring into the groove of the rear crankcase cover.

Install the dowel pins.

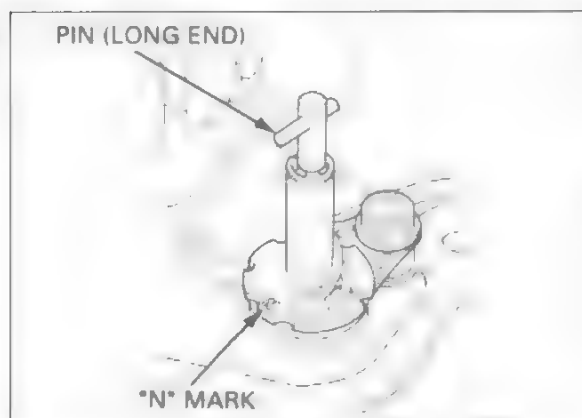
Apply sealant to the indicated area of the alternator cover as shown.



Shift the transmission into neutral, by aligning the slit of the shift drum with the index mark on the crank case as shown.



Align the long end of the neutral/reverse (gear position) switch pin with the "N" mark on the switch as shown.



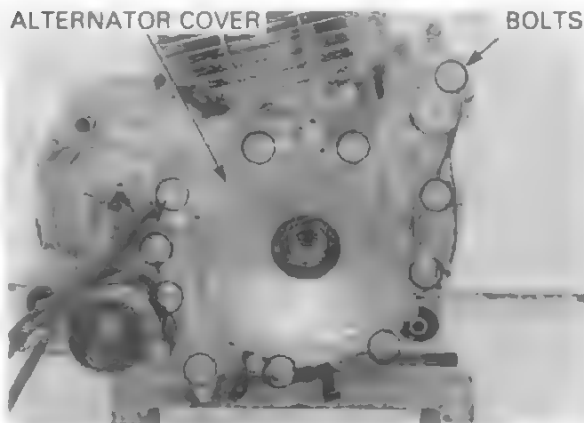
Install the alternator cover and tighten the eleven bolts securely.

## CAUTION:

*The alternator cover (stator) is magnetically attracted to the flywheel, be careful not to pinch your finger.*

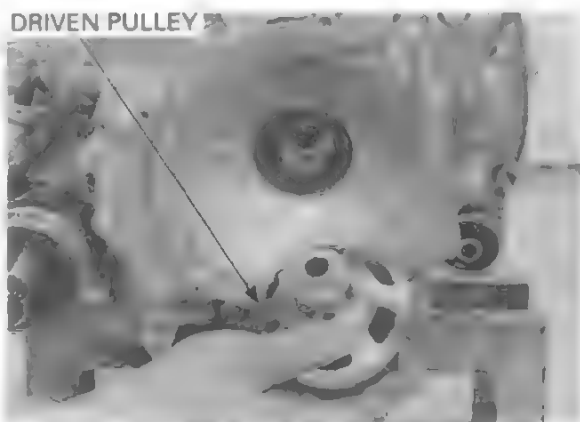
## NOTE:

If the cover doesn't install easily, remove it and check the alignment of the reverse/neutral (gear position) switch with the shift drum. Be careful not to damage the pin on the switch.



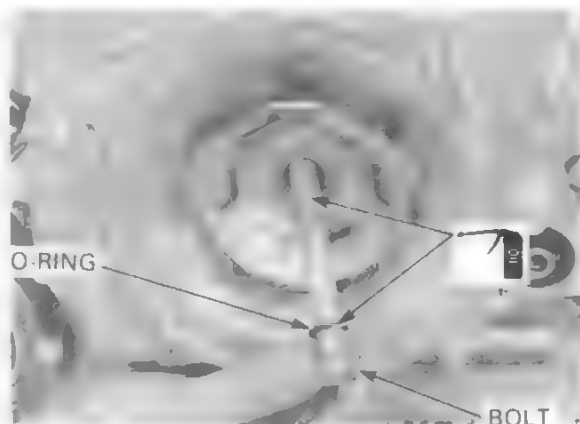
Install the starter motor (page 19-7).

Install the starter driven pulley aligning the boss with the groove on the flywheel.



## ALTERNATOR/STARTER CLUTCH

Apply oil to the driven pulley bolt threads and O-ring.  
Install the driven pulley bolt with a O-ring.



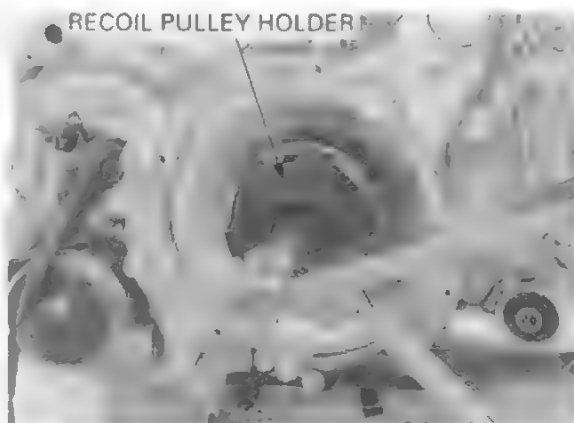
Hold the starter driven pulley using the special tool, then tighten the bolt to the specified torque.

**TOOL:**

Recoil pulley holder      07SMB-HM70100

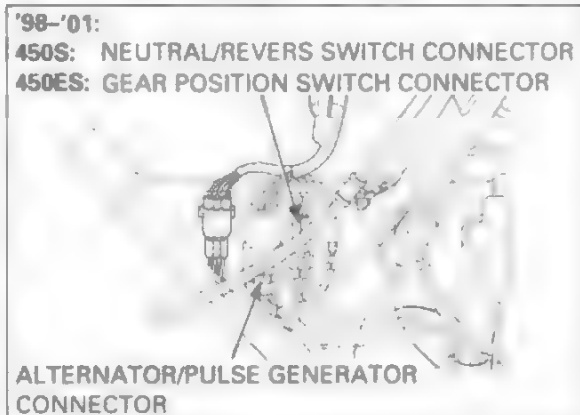
**TORQUE:** 108 N-m (11.0 kgf-m, 80 lbf-ft)

Install the recoil starter (page 10-6).



**TRX450S/FM:** Connect the neutral/reverse switch and alternator/pulse generator connector.

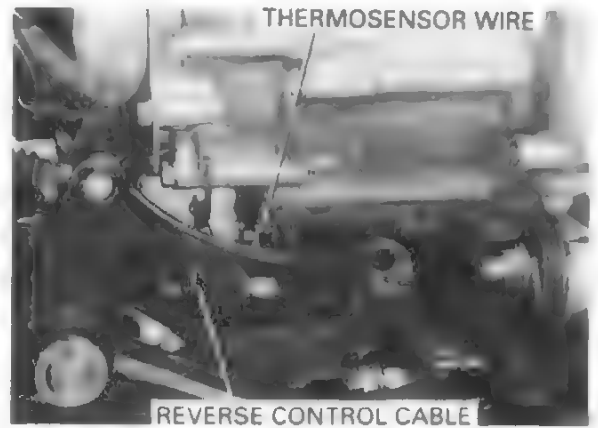
**TRX450ES/FE:** Connect the gear position switch and alternator/pulse generator connector.

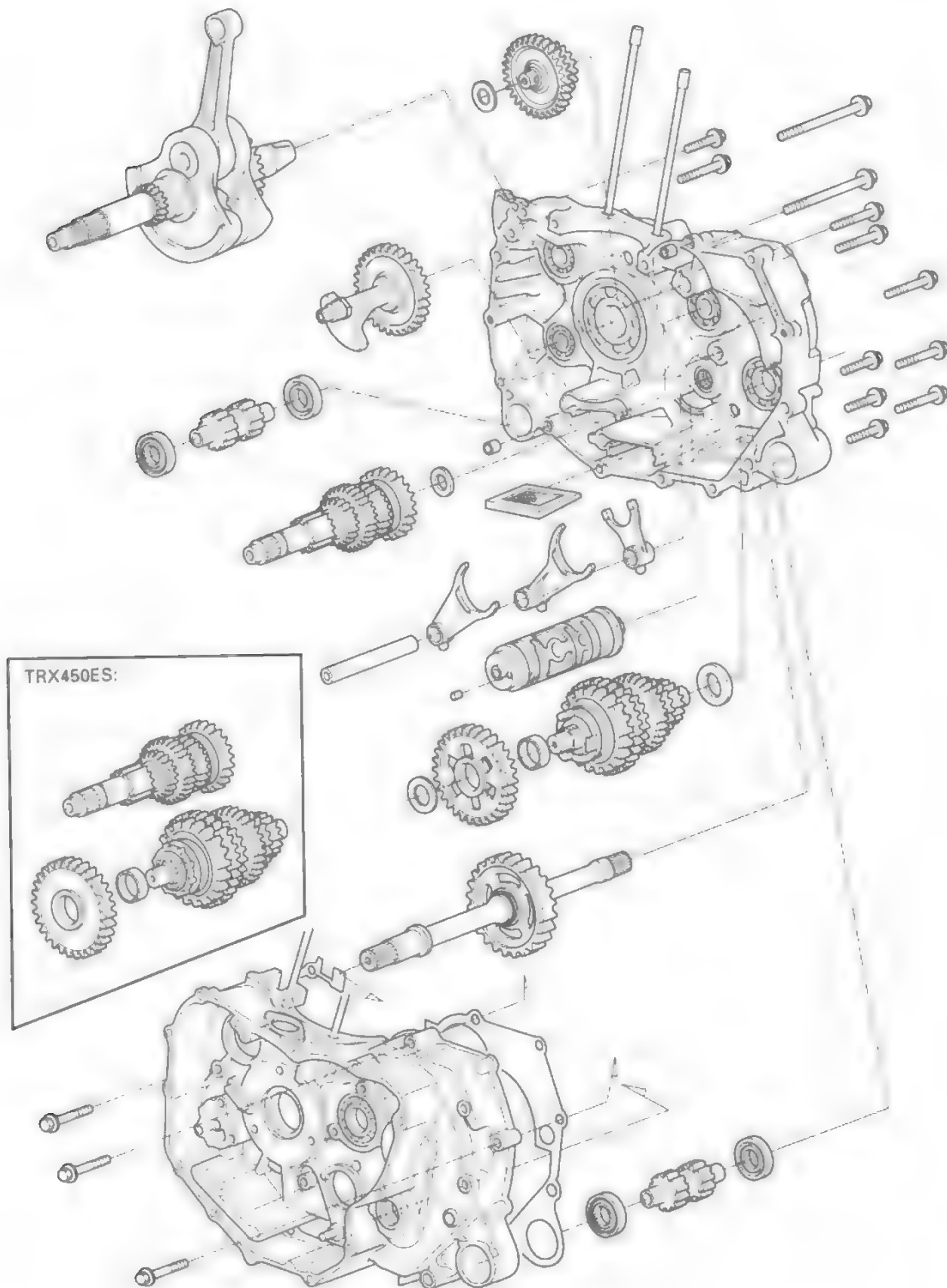


Connect the thermosensor connector to the sensor.

Connect the reverse control cable end to the lever.

Adjust the reverse selector lever free play (page 3-18).





# 11. CRANKSHAFT/BALANCER/TRANSMISSION

SERVICE INFORMATION	11-1	TRANSMISSION	11-4
TROUBLESHOOTING	11-3	CRANKSHAFT/BALANCER	11-16
CRANKCASE SEPARATION	11-4	CRANKCASE ASSEMBLY	11-19

## SERVICE INFORMATION

### GENERAL

- For crankshaft and transmission repair, the crankcase must be separated and engine must be removed from the frame.
- The following components must be removed before separating the crankcase.
  - Centrifugal clutch, change clutch (Section 8)
  - Cylinder head, cylinder, piston (Section 7)
  - Alternator, starter clutch (Section 10)
  - Gearshift linkage (Section 9)
  - Oil pump (Section 4)

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARDS	SERVICE LIMIT	
Crankshaft, connecting rod	Side clearance		0.05 – 0.65 (0.002 – 0.026)	0.80 (0.031)	
	Radial clearance		0.006 – 0.018 (0.0002 – 0.0007)	0.05 (0.002)	
	Runout		—	0.05 (0.002)	
Transmission	Gear I.D.	M4	25.000 – 25.021 (0.9843 – 0.9851)	25.05 (0.986)	
		M5	20.000 – 20.021 (0.7874 – 0.7882)	25.05 (0.986)	
		C1, C2, C3	28.020 – 28.041 (1.1031 – 1.1040)	28.07 (1.105)	
		CR	28.021 – 28.042 (1.1032 – 1.1040)	28.07 (1.105)	
		Reverse idle	18.000 – 18.021 (0.7087 – 0.7095)	18.05 (0.711)	
	Shaft O.D.	M4	21.959 – 21.980 (0.8645 – 0.8654)	21.93 (0.863)	
		M5	16.983 – 16.994 (0.6686 – 0.6691)	16.95 (0.667)	
		Reverse idle	13.966 – 13.984 (0.5498 – 0.5506)	13.93 (0.548)	
	Gear bushing	C1 O.D.		27.984 – 28.005 (1.1017 – 1.1026)	27.93 (1.100)
		C2 O.D.		27.979 – 28.000 (1.1015 – 1.1024)	27.93 (1.100)
		CR O.D.		27.979 – 28.000 (1.1015 – 1.1024)	27.93 (1.100)
		M4	I.D.	22.000 – 22.021 (0.8661 – 0.8670)	22.05 (0.868)
			O.D.	24.959 – 24.980 (0.9826 – 0.9835)	24.93 (0.981)
		M5	I.D.	17.016 – 17.034 (0.6699 – 0.6706)	17.06 (0.672)
			O.D.	19.966 – 19.984 (0.7861 – 0.7868)	19.93 (0.785)
		R	I.D.	14.000 – 14.025 (0.5512 – 0.5522)	14.05 (0.553)
			O.D.	17.966 – 17.984 (0.7073 – 0.7080)	17.93 (0.706)

# CRANKSHAFT/BALANCER/TRANSMISSION

Unit: mm (in)

ITEM			STANDARDS	SERVICE LIMIT
Transmission	Gear-to-bushing clearance	M4	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.018 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
		C1	0.015 – 0.057 (0.0006 – 0.0022)	0.10 (0.004)
		C2	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		CR	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		C3	0.015 – 0.057 (0.0006 – 0.0022)	0.10 (0.004)
		Reverse idle	0.018 – 0.055 (0.0006 – 0.0022)	0.10 (0.004)
	Bushing-to-shaft clearance	M4	0.020 – 0.062 (0.0008 – 0.0024)	0.10 (0.004)
		M5	0.022 – 0.051 (0.0009 – 0.0020)	0.10 (0.004)
		Reverse idle	0.018 – 0.059 (0.0006 – 0.0023)	0.10 (0.004)
Shift fork, shaft	Fork	I.D.	13.000 – 13.021 (0.5118 – 0.5126)	13.04 (0.513)
		Claw thickness	4.93 – 5.00 (0.194 – 0.197)	4.50 (0.177)
	Fork shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	12.96 (0.510)

## TOOLS

Bearing remover set	07936-3710001 Not available in U.S.A.
– Remover handle	07936-3710100
– Bearing remover, 20 mm	07936-3710600
– Remover weight	07741-0010201 or 07936-371020A or 07936-3710200
Remover handle	07936-3710100
Bearing remover, 17 mm	07936-3710300
Remover weight	07741-0010201 or 07936-371020A or 07936-3710200
Assembly collar	07965-VM00100
Assembly shaft	07965-VM00200 or 07931-ME4010B and 07931-HB3020A
Threaded adaptor	07965-VM00300 or 07931-KF00200 (U.S.A. only)
Driver	07749-0010000
Attachment, 24 X 26 mm	07746-0010700
Attachment, 37 X 40 mm	07746-0010200
Attachment, 42 X 47 mm	07746-0010300
Attachment, 52 X 55 mm	07746-0010400
Attachment, 72 X 75 mm	07746-0010600
Pilot, 22 mm	07746-0041000
Pilot, 17 mm	07746-0040400
Pilot, 20 mm	07746-0040500
Pilot, 25 mm	07746-0040600
Pilot, 35 mm	07746-0040800
Pilot, 40 mm	07746-0040900
Pilot, 32 mm	07MAD-PR90200

## TROUBLESHOOTING

### **Crankshaft noisy**

- Worn connecting rod big end bearing
- Bent connecting rod
- Worn crankshaft bearing

### **Transmission jumps out of gear**

- Shift fork bent or damaged
- Shift fork shaft bent
- Shift fork claw bent
- Gear engagement dogs or slots worn

### **Hard to shift**

- Incorrect clutch adjustment
- Shift fork bent or damaged
- Shift fork shaft bent



### CRANKCASE SEPARATION

#### NOTE:

Refer to page 11-1 for the parts which must be removed before separating the crankcase.

Remove the engine hanger bushing dust seals and drive out the hanger bushings.

Remove the three front crankcase bolts.

Remove the final drive shaft O-ring.

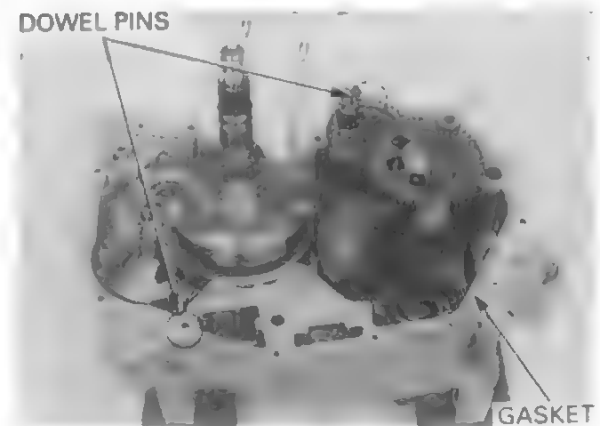
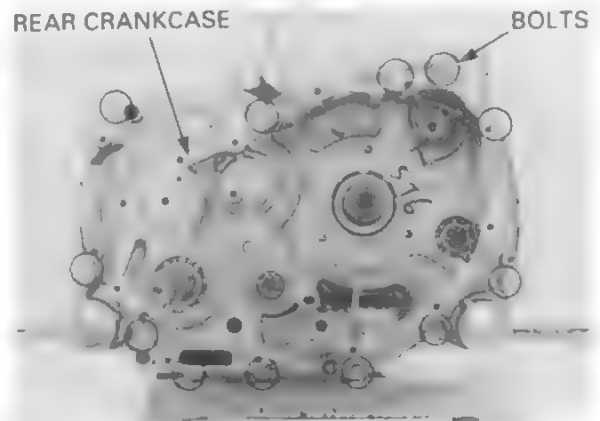
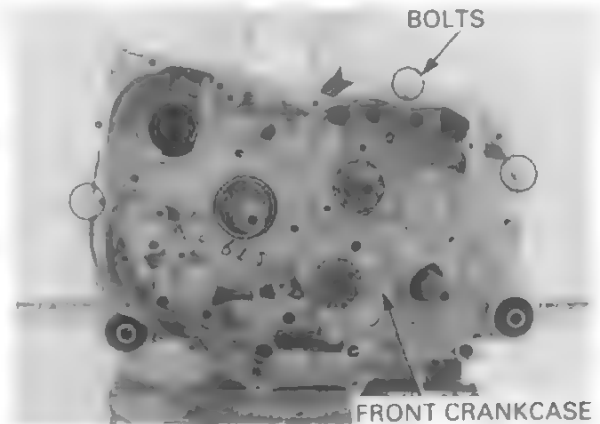
Loosen the twelve rear crankcase bolts in a crisscross pattern in 2 or 3 steps to prevent crankcase distortion.

Remove the rear crankcase bolts.

Remove the O-ring from the mainshaft.  
Place the crankcase with the rear crankcase down and remove the front crankcase.

Remove the gasket and dowel pins.

Install a new O-ring onto the mainshaft.

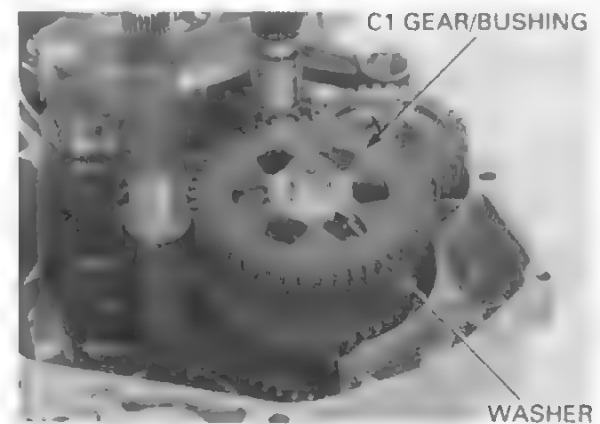


### TRANSMISSION

#### REMOVAL/DISASSEMBLY

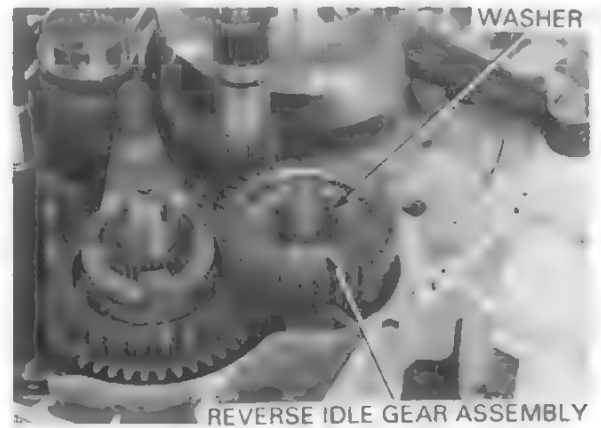
Remove the following:

- Copper washer
- C1 gear
- C1 gear bushing



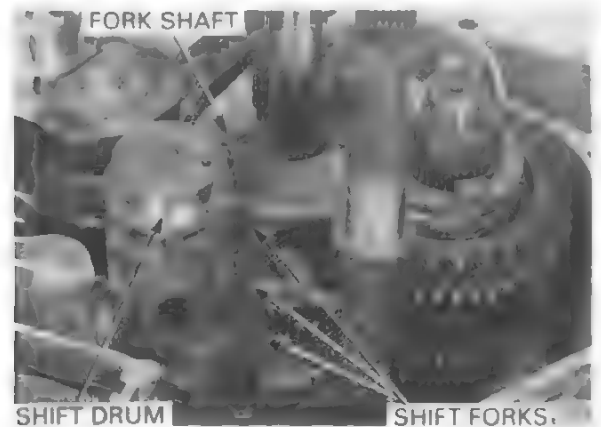
Remove the following:

- Thrust washer
- Reverse idle gear assembly

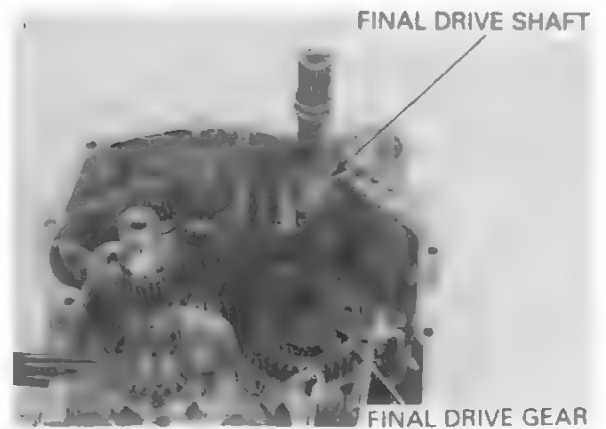


- Shift fork shaft
- Front shift fork
- Center shift fork
- Rear shift fork
- Shift drum

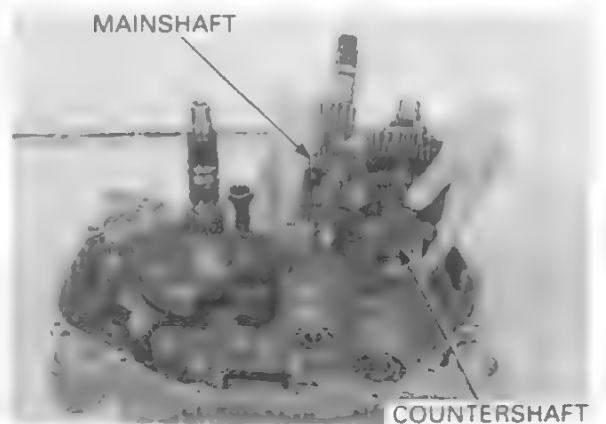
*If you do not remove the reverse stopper arm, it is necessary to hold down the reverse arm to remove the shift drum.*



Remove the final drive shaft and final drive gear.



Remove the mainshaft and countershaft as an assembly.  
Remove the mainshaft thrust washer.

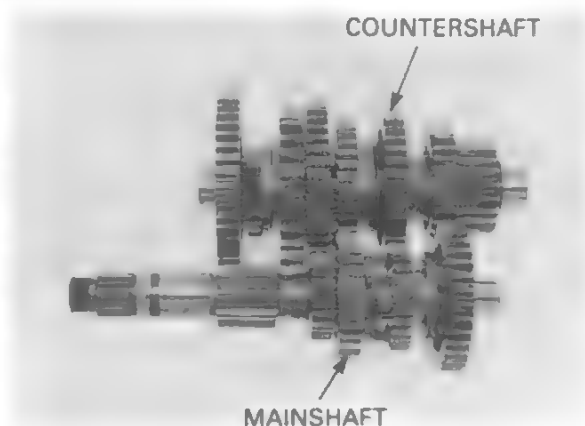


## CRANKSHAFT/BALANCER/TRANSMISSION

Disassemble the mainshaft and countershaft.

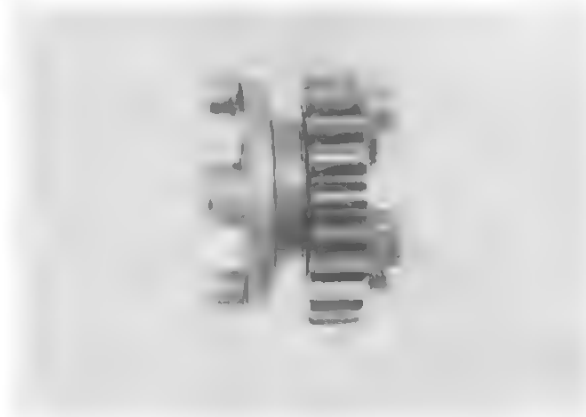
### NOTE:

- Keep track of the disassembled parts (gears, bushings, washers, and snap rings) by stacking them on a tool or slipping them onto a piece of wire.
- Do not expand the snap ring more than necessary for removal. To remove a snap ring, expand the snap ring and pull it off using the gear behind it.



## INSPECTION

Check the gear dogs, dog holes and teeth for abnormal wear or lack of lubrication.



Measure the I.D. of each gear.

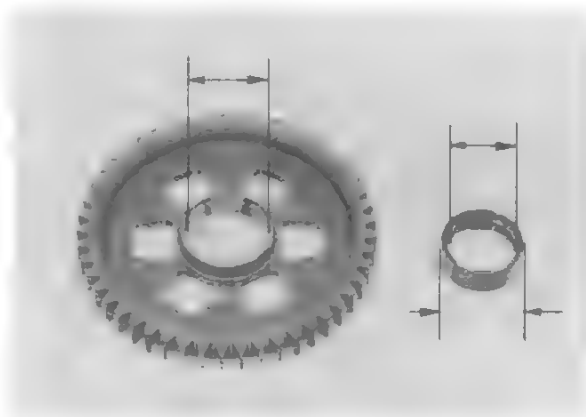
### SERVICE LIMITS:

C1, C2, C3, CR:	28.07 mm (1.105 in)
M4, M5	25.05 mm (0.986 in)

Measure the I.D. and O.D. of each gear bushing.

### SERVICE LIMITS:

C1, C2, CR O.D. :	27.93 mm (1.100 in)
M4: O.D. :	24.93 mm (0.981 in)
I.D. :	22.05 mm (0.868 in)
M5: O.D. :	19.93 mm (0.785 in)
I.D. :	17.06 mm (0.672 in)



Calculate the gear-to-gear bushing clearance.

**SERVICE LIMIT: 0.10 mm (0.004 in)**

Check the shift fork groove of the shifter gear for excessive wear or damage.

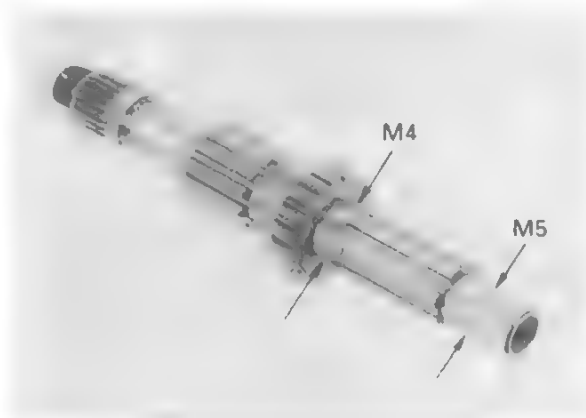
Measure the O.D. of the mainshaft.

### SERVICE LIMITS:

M4:	21.93 mm (0.863 in)
M5:	16.95 mm (0.667 in)

Calculate the gear bushing-to-shaft clearance.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



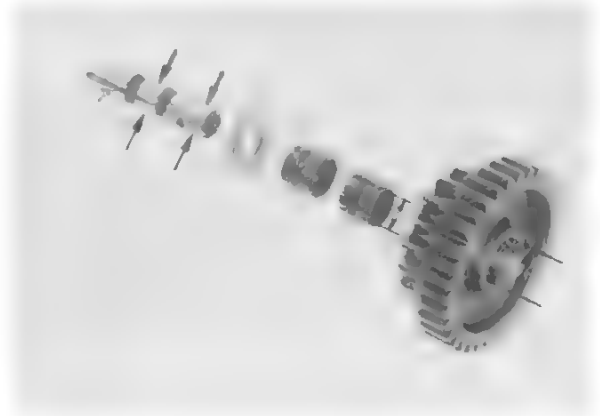
Disassemble the reverse idle gear assembly.

Measure the O.D. of the reverse idle gear shaft.

**SERVICE LIMIT: 13.93 mm (0.548 in)**

Calculate the bushing-to-shaft clearance.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



Check the shift fork and fork shaft for wear or damage.

Measure the I.D. of the shift fork.

**SERVICE LIMIT: 13.04 mm (0.513 in)**

Measure the shift fork claw thickness.

**SERVICE LIMIT: 4.50 mm (0.177 in)**

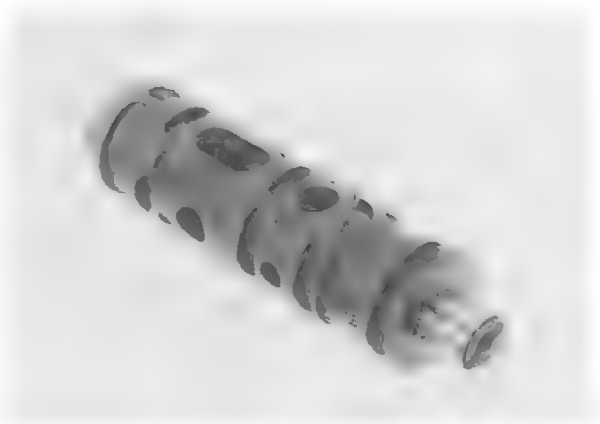


Measure the O.D. of the shift fork shaft.

**SERVICE LIMIT: 12.96 mm (0.510 in)**



Inspect the shift drum grooves for wear or damage.

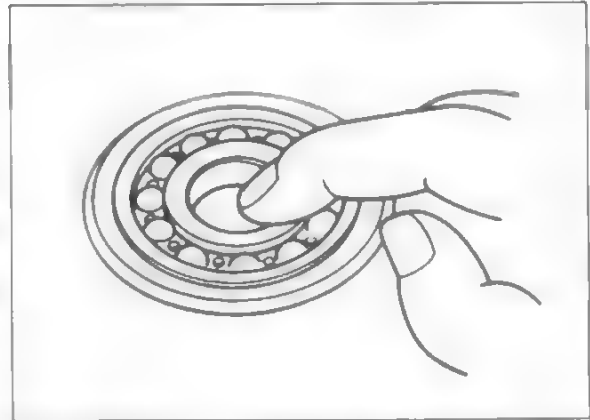


## BEARING REPLACEMENT

### NOTE:

For crankshaft bearing replacement, see page 11-16.

Turn the inner race of each bearing with your finger. The bearings should turn smoothly and quietly. Also check that the outer race of each bearing fits tightly in the crankcase.



## FRONT CRANKCASE

Remove the final shaft oil seal.

If the bearings need replacement, drive out the mainshaft and shift drum bearing. Remove the countershaft bearing using the special tools.

### TOOLS:

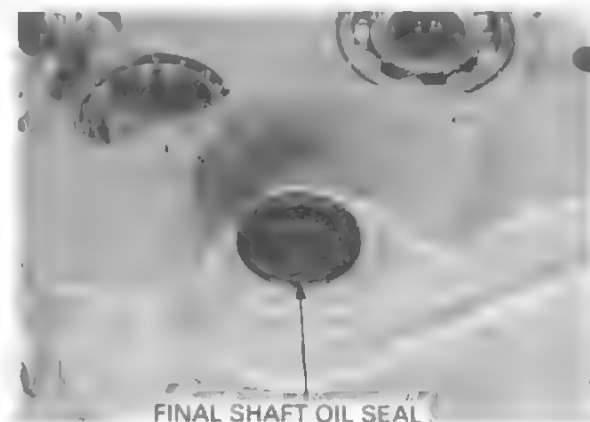
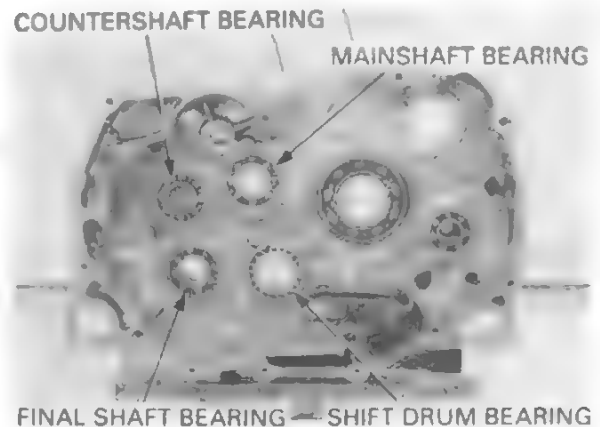
<b>Bearing remover set</b>	<b>07936-3710001</b> (Not available in U.S.A.) or
- Remover handle	07936-3710100
- Bearing remover, 20 mm	07936-3710600
- Remover weight	07741-0010201 or 07936-3710200 or 07936-371020A (U.S.A. only)

Drive new bearings into the front crankcase using the special tools.

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Mainshaft bearing:</b>	
Attachment, 52 X 55 mm	07746-0010400
Pilot, 22 mm	07746-0041000
<b>Countershaft bearing:</b>	
Attachment, 42 X 47 mm	07746-0010300
Pilot, 20 mm	07746-0040500
<b>Final shaft bearing:</b>	
Attachment, 42 X 47 mm	07746-0010300
Pilot, 22 mm	07746-0041000
<b>Shift drum bearing:</b>	
Attachment, 42 X 47 mm	07746-0010300
Pilot, 35 mm	07746-0040800

Install the new final shaft oil seal.



## REAR CRANKCASE

Drive out the final shaft bearing from the rear crankcase.

Remove the rear crankcase bearings using the special tools.

### TOOLS:

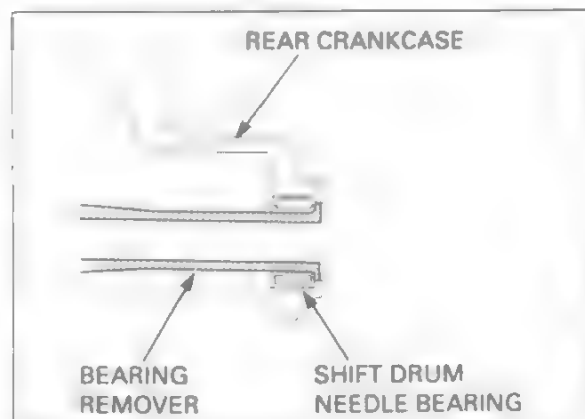
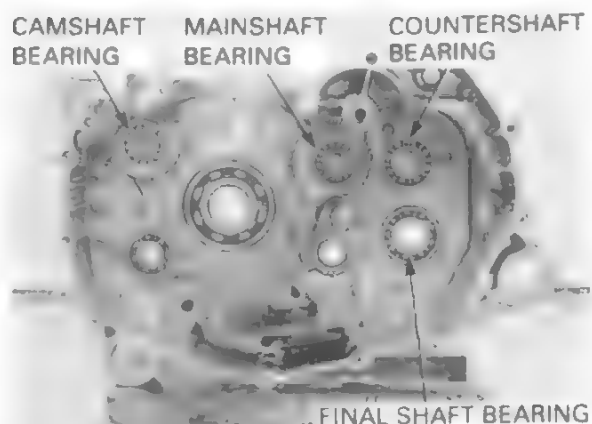
**Mainshaft, camshaft and shift drum bearings:**

<b>Remover handle</b>	<b>07936-3710100</b>
<b>Bearing remover, 17 mm</b>	<b>07936-3710300</b>
<b>Remover weight</b>	<b>07741-0010201 or</b>
	<b>07936-3710200 or</b>
	<b>07936-371020A</b>
	<b>(U.S.A. only)</b>

**Countershaft bearing:**

<b>Bearing remover set</b>	<b>07936-3710001</b>
	<b>(Not available in</b>
	<b>U.S.A.)</b>
<b>- Remover handle</b>	<b>07936-3710100</b>
<b>- Bearing remover, 20 mm</b>	<b>07936-3710600</b>
<b>- Remover weight</b>	<b>07741-0010201 or</b>
	<b>07936-371020A or</b>
	<b>07936-3710200</b>
	<b>(U.S.A. only)</b>

*Make sure bearing  
puller is inside case  
lip before removing  
shift drum needle  
bearing*



Drive new bearings into the rear crankcase.

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
---------------	----------------------

**Countershaft bearing:**

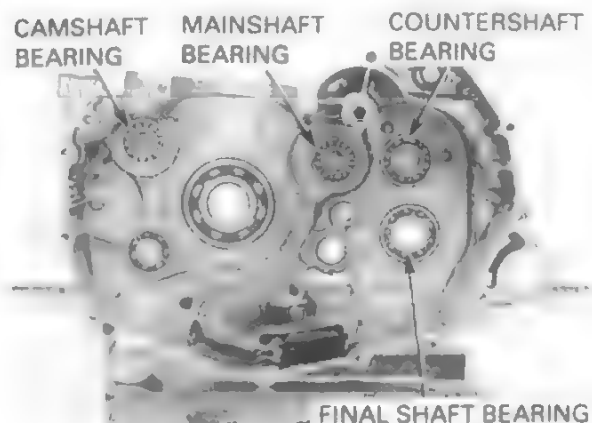
<b>Attachment, 42 X 47 mm</b>	<b>07746-0010300</b>
<b>Pilot, 20 mm</b>	<b>07746-0040500</b>

**Mainshaft/camshaft bearing:**

<b>Attachment, 37 X 40 mm</b>	<b>07746-0010200</b>
<b>Pilot, 17 mm</b>	<b>07746-0040400</b>

**Final shaft bearing:**

<b>Attachment, 52 X 55 mm</b>	<b>07746-0010400</b>
<b>Pilot, 25 mm</b>	<b>07746-0040600</b>

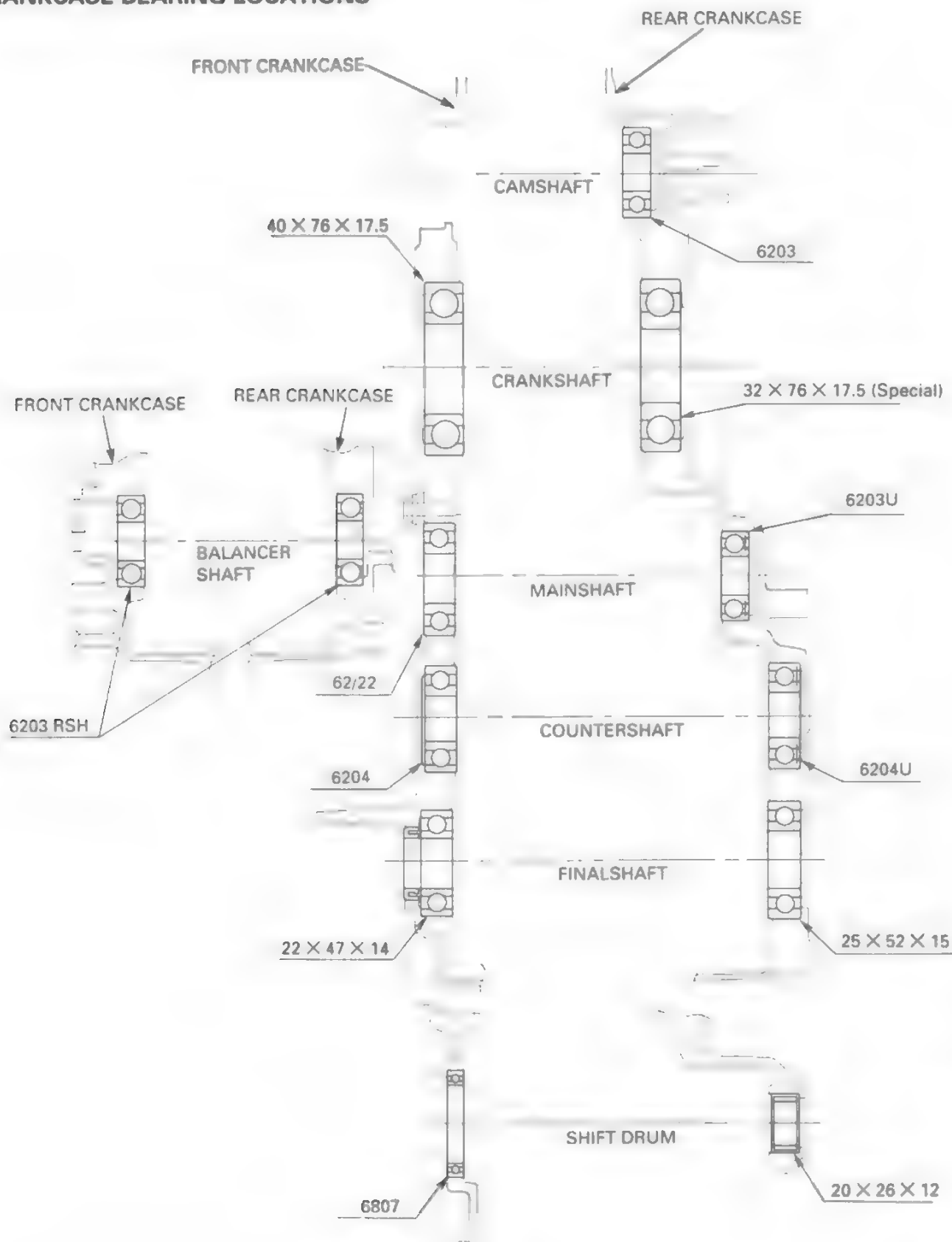


Press the shift drum needle bearing using the special tools and hydraulic press.

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 24 X 26 mm</b>	<b>07746-0010700</b>

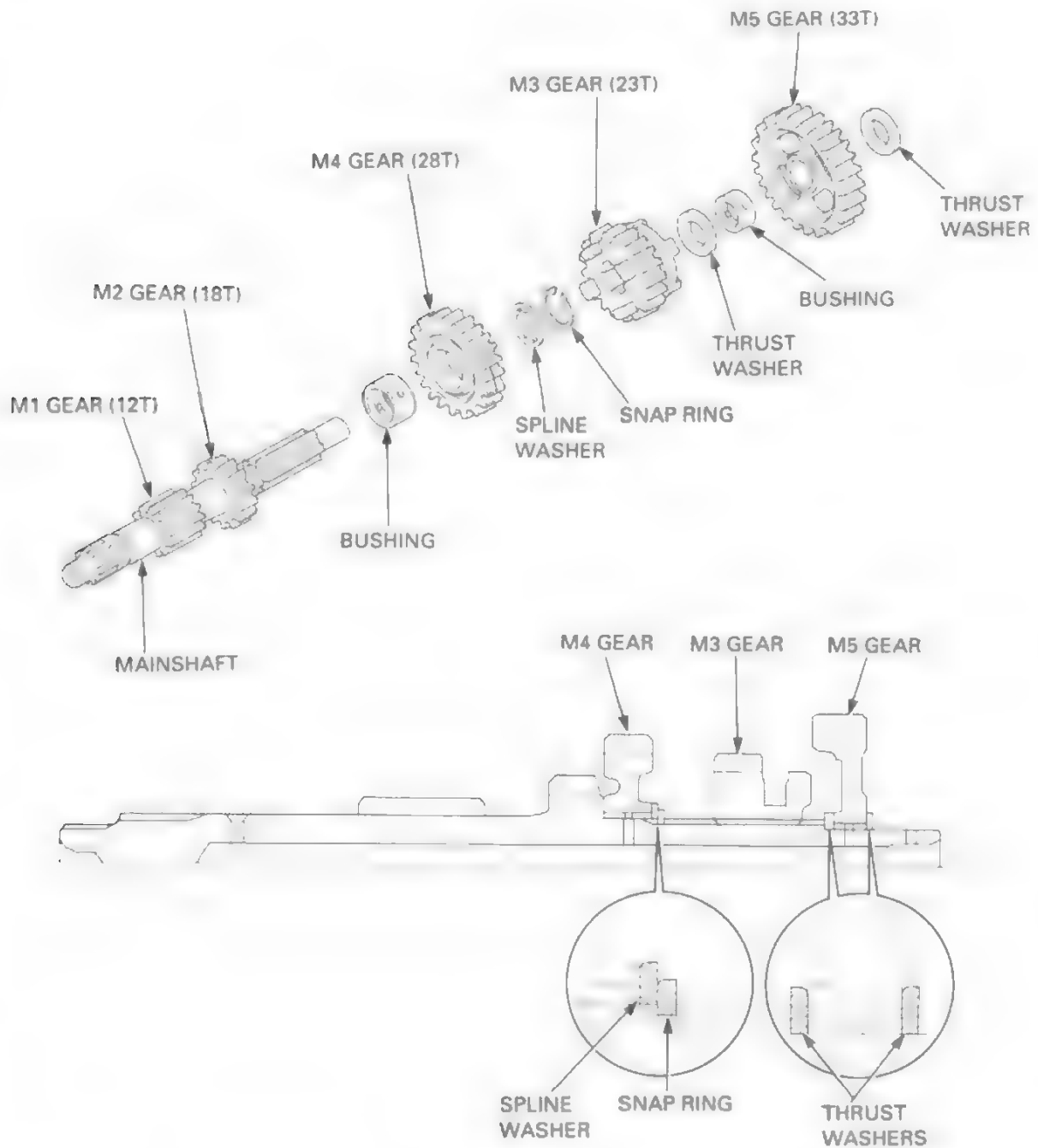
## CRANKCASE BEARING LOCATIONS



## ASSEMBLY/INSTALLATION

## NOTE:

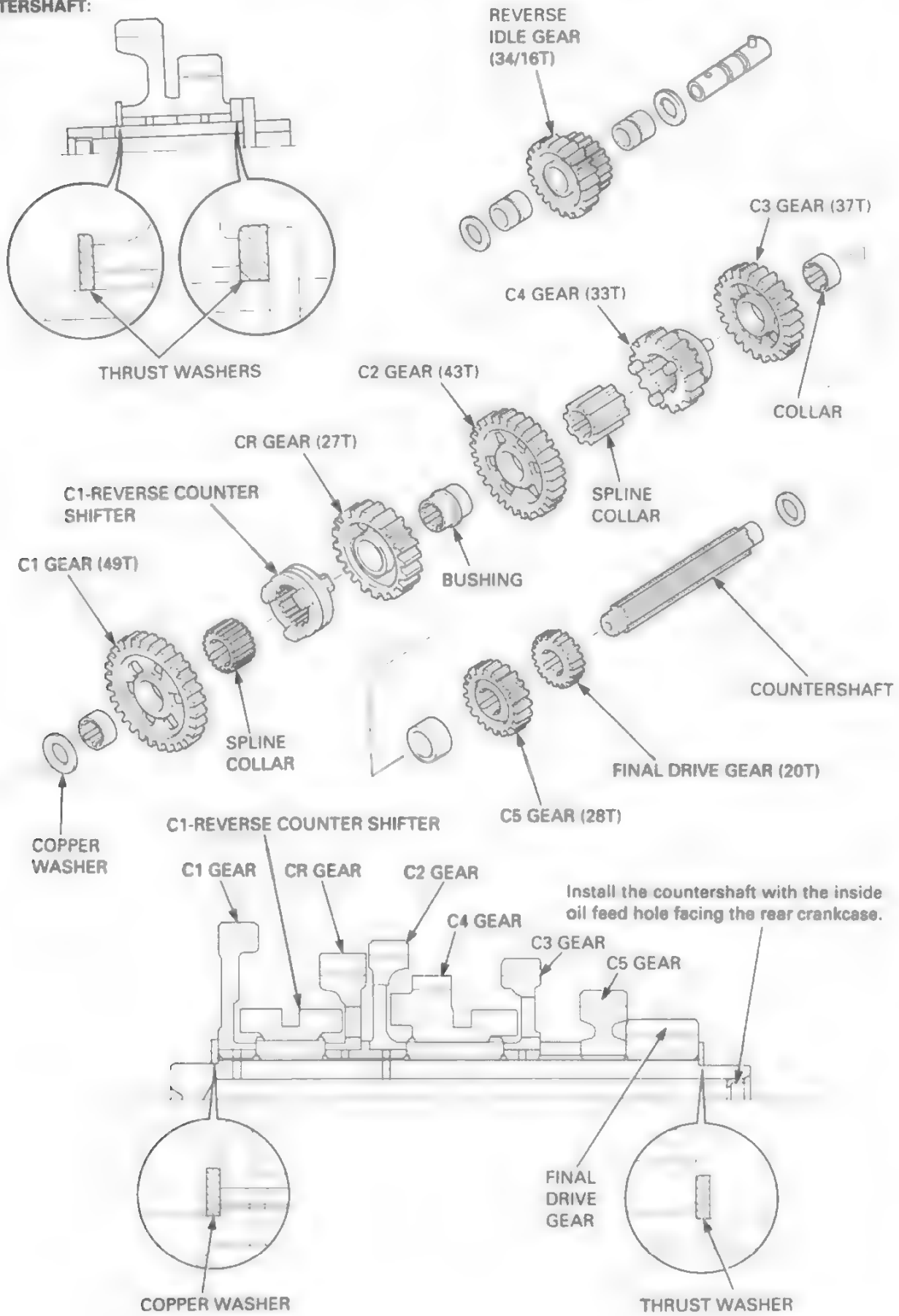
- Apply oil to the shifter gear grooves.
- Always install the thrust washers and snap rings with the chamfered (rolled) edge facing away from the thrust load. After installing the snap ring, slightly open the ring and rotate it in its groove to be sure it is fully seated. Do not use worn snap ring which could easily spinning in the groove. They may be too loose to properly seat in the groove.
- Align the gap in the snap ring with the groove of spline.
- Align the oil holes on the shafts and bushings.
- The countershaft must be installed with the inside oil feed hole to the back, and the outside oil holes to the front as shown.

**TRX450S/FM**  
**MAIN SHAFT:**


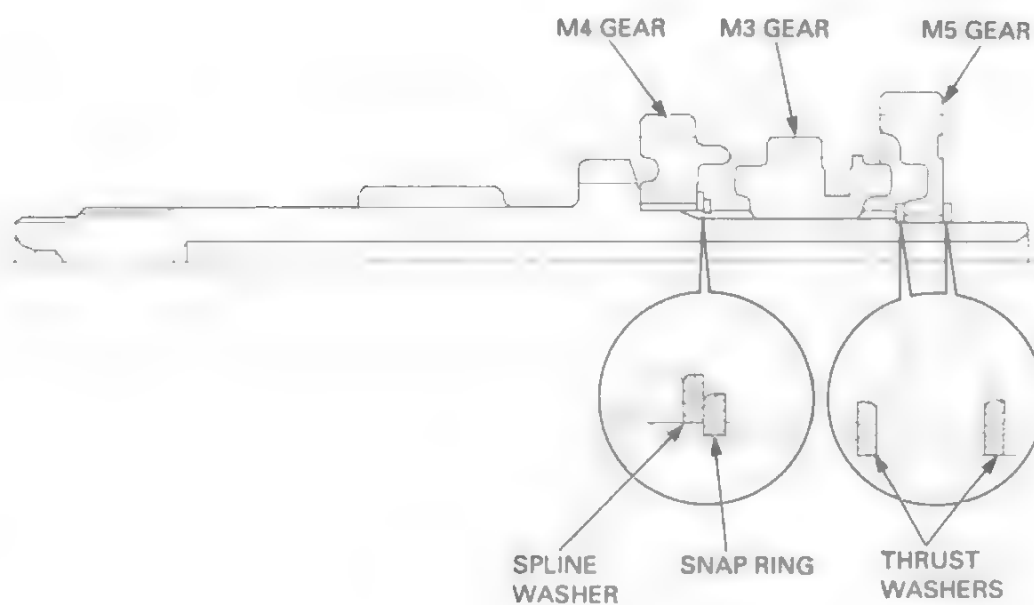
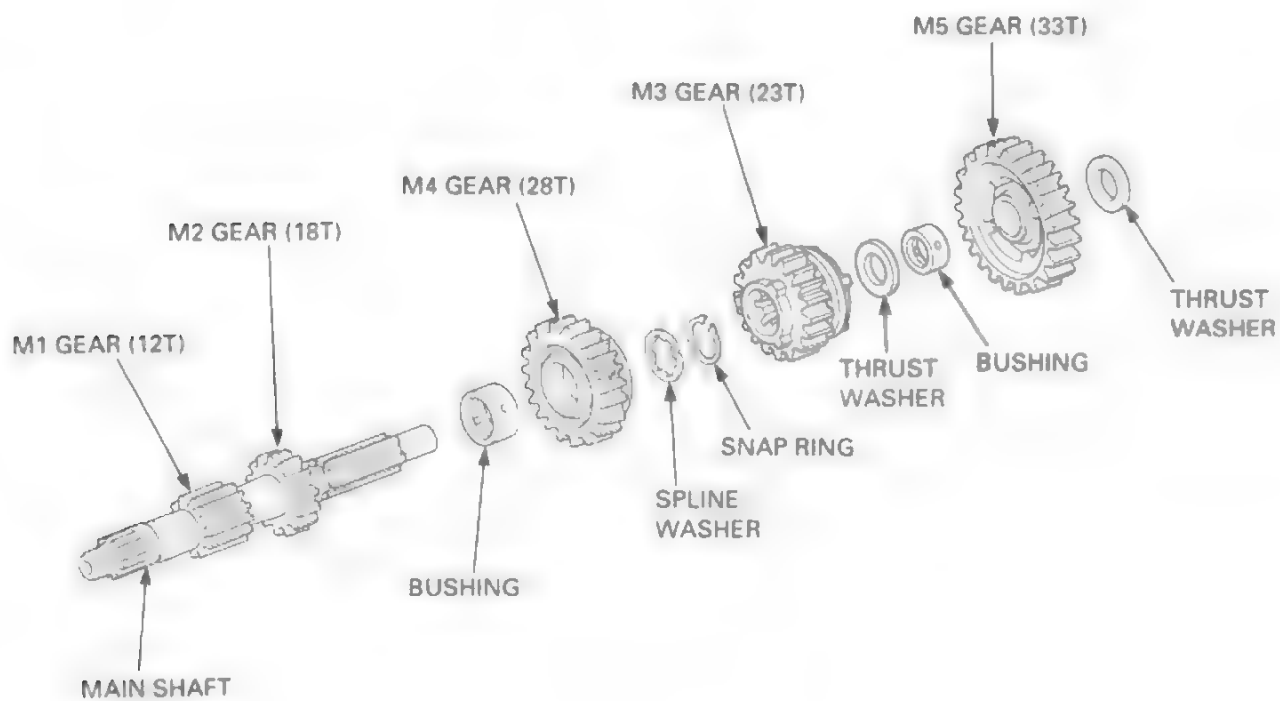


# CRANKSHAFT/BALANCER/TRANSMISSION

## COUNTERSHAFT:

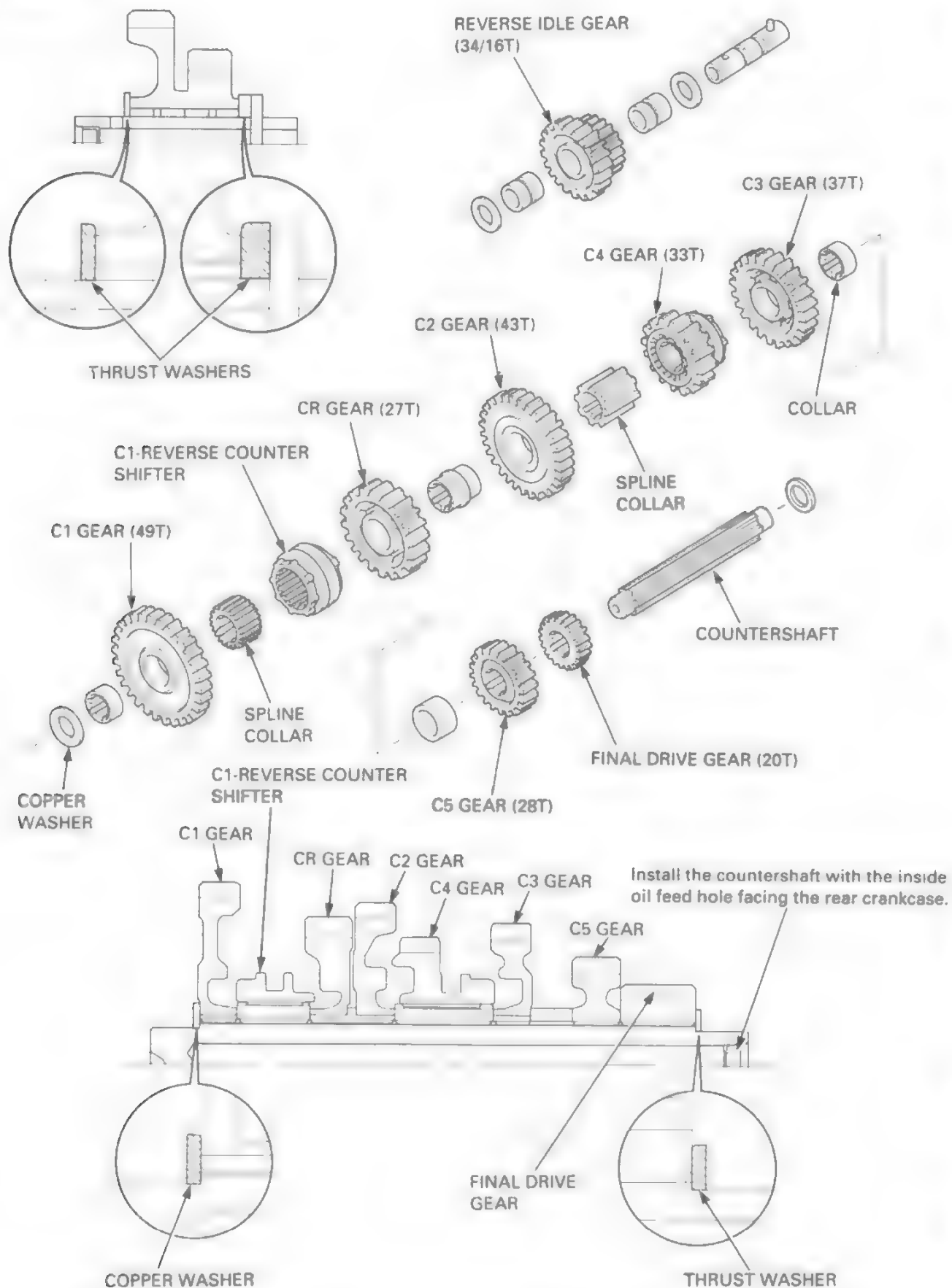


TRX450ES/FE  
MAINSHAFT:



## CRANKSHAFT/BALANCER/TRANSMISSION

### COUNTERSHAFT:



Install the mainshaft end washer into the crankcase. Install the mainshaft and countershaft as an assembly.

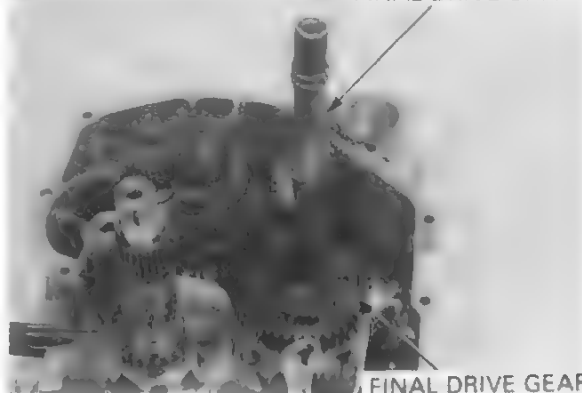
Verify that the top end of the countershaft does not have an oil feed hole.

MAINSHAFT/COUNTERSHAFT ASSEMBLY



Assemble the final drive gear and shaft, then install the drive shaft assembly into the rear crankcase.

FINAL DRIVE SHAFT



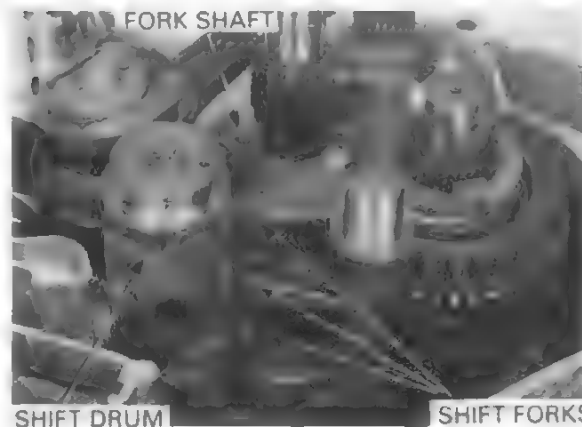
Install the shift drum.

Install the rear shift fork into the M2 shifter gear groove with its "RR" mark facing up. Install the center shift fork into the C3 shifter gear groove with its "C" mark facing up. Install the front shift fork into the counter shifter groove with its "FR" mark facing up.

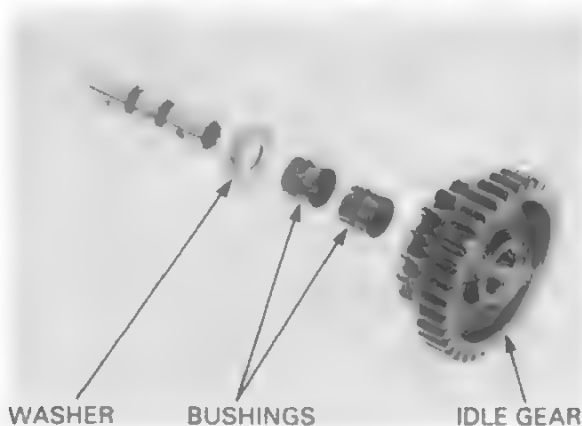
Make sure all of the shift fork pins are aligned with the grooves in the shift drum.

Install the shift fork shaft.

SHIFT FORK SHAFT

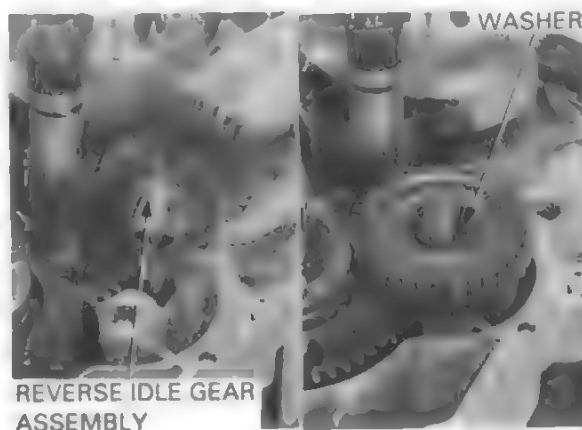


Assemble the reverse idle gear, bushings, washer and shaft.

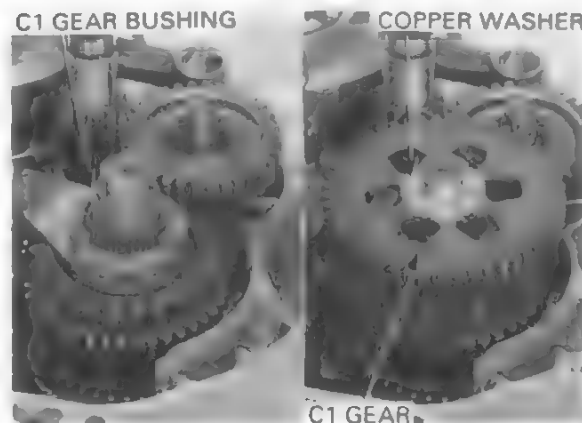


## CRANKSHAFT/BALANCER/TRANSMISSION

Install the reverse idle gear aligning the pin on the shaft with the crankcase groove.  
Install the washer.



Install the C1 gear bushing making sure oil passages are aligned, C1 gear and copper washer.

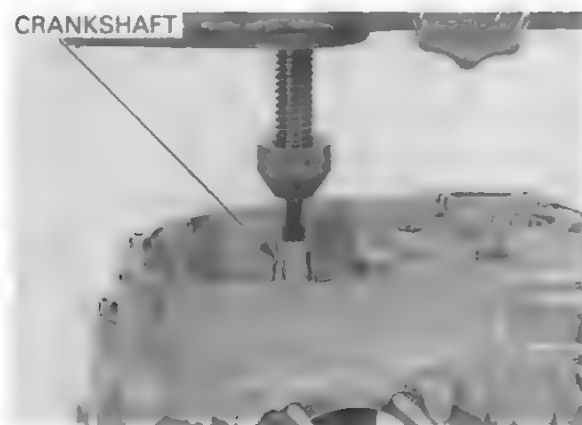


## CRANKSHAFT/BALANCER

### REMOVAL

Remove the transmission (page 11-4).

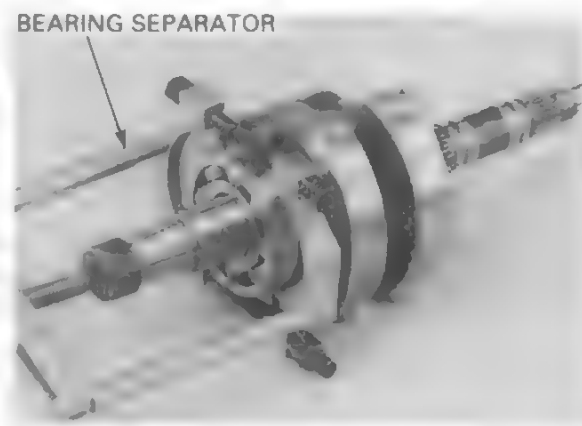
Remove the crankshaft and balancer from the rear crankcase using a hydraulic press.



If the rear crankshaft bearing remains on the crankshaft, remove it with a commercially available bearing separator (4 1/2 in) as shown.  
If the bearing remains in the rear crankcase, drive it out from the outside.  
Discard the rear crankshaft bearing.

### NOTE:

Always replace the rear bearing with a new one whenever the crankshaft is removed from the rear crankcase.



## INSPECTION

Set the crankshaft in a stand or V-blocks and read the runout using dial indicators at the A and B points as shown.

**SERVICE LIMIT: 0.05 mm (0.002 in)**



Measure the side clearance between the connecting rod big end and the crankshaft weight with a feeler gauge.

**SERVICE LIMIT: 0.80 mm (0.031 in)**

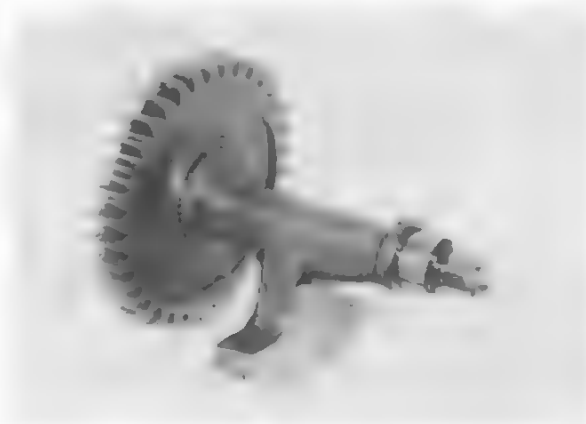


Measure the radial clearance at the connecting rod big end, at two points in the directions indicated by the arrows.

**SERVICE LIMIT: 0.05 mm (0.002 in)**

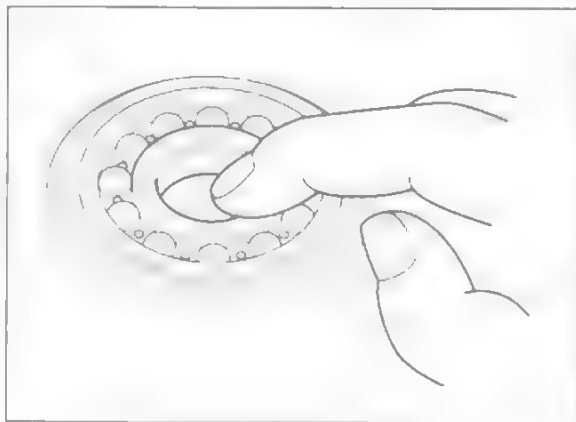


Check the balancer gear teeth for abnormal wear or damage.



### BEARING REPLACEMENT

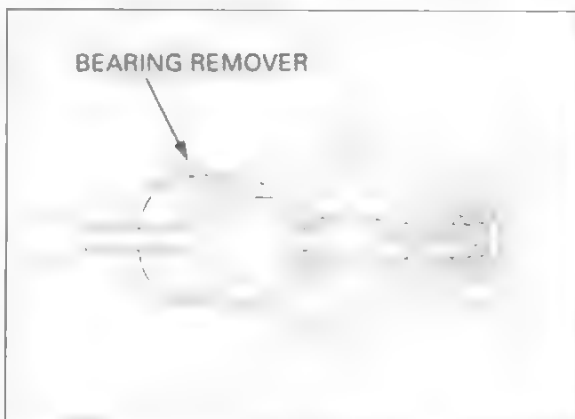
Turn the inner race of each bearing with your finger. The bearings should turn smoothly and quietly. Also check the outer race of each bearing fits tightly in the crankcase.



Drive out the crankshaft bearing.  
Pull the balancer bearings out of the crankcase using the special tools as shown.

#### TOOLS:

Remover handle	07936-3710100
Bearing remover, 17 mm	07936-3710300
Remover weight	07741-0010201 or 07939-3710200 or 07936-371020A (U.S.A. only)



Drive new bearings in using the following tools.

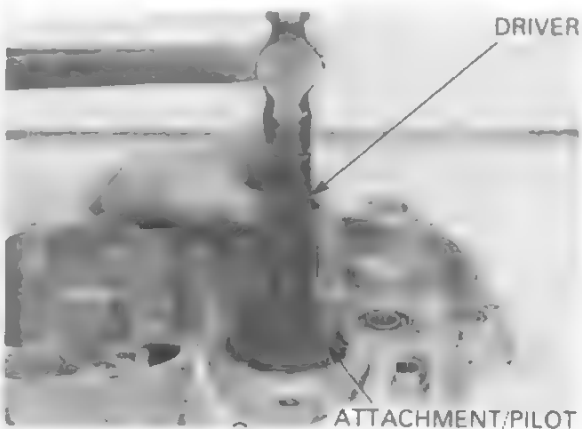
#### TOOLS:

##### Crankshaft bearing:

Driver	07749-0010000
Attachment, 72 X 75 mm	07746-0010600
Pilot, 40 mm	07746-0040900

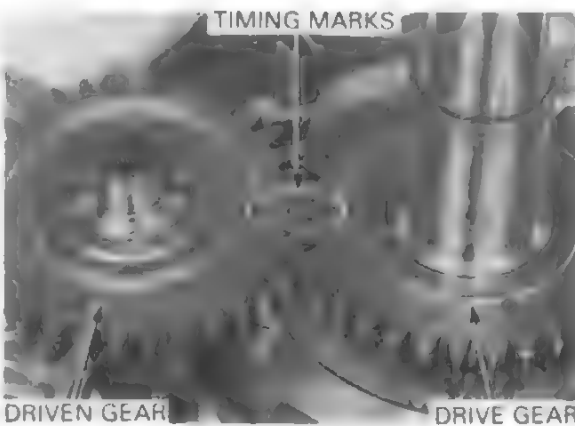
##### Balancer bearing:

Driver	07749-0010000
Attachment, 37 X 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400



### INSTALLATION

Temporarily install the balancer and crankshaft in the front crankcase and align their timing marks.



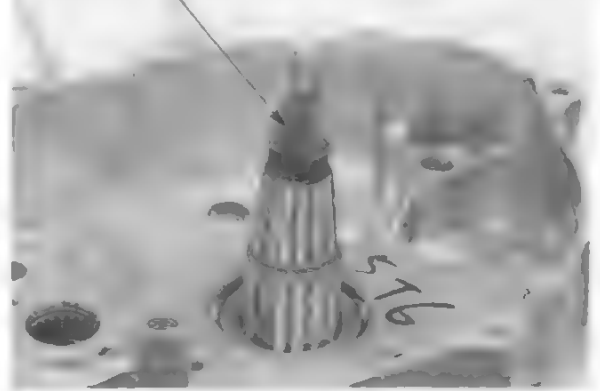
Install the rear crankcase on the front crankcase.  
Install the threaded adapter on the crankshaft.

**TOOL:**

**Threaded adapter**

07965-VM00300 or  
07931-KF00200  
(U.S.A. only)

THREADED ADAPTER



Draw the crankshaft into the rear crankcase using the special tools.

**TOOLS:**

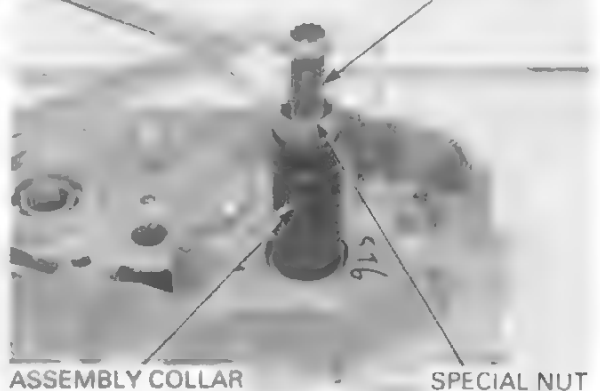
**Assembly collar**

**Assembly shaft**

**Special nut**

07965-VM00100  
07965-VM00200 or  
07931-ME4010B and  
(U.S.A. only)  
07931-HB3020A

ASSEMBLY SHAFT

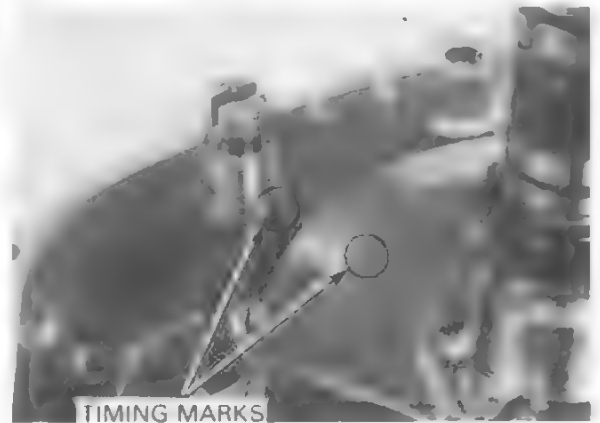


ASSEMBLY COLLAR

SPECIAL NUT

Remove the front crankcase and make sure the index marks on the balancer and crankshaft are aligned.

Install the transmission (page 11-11).

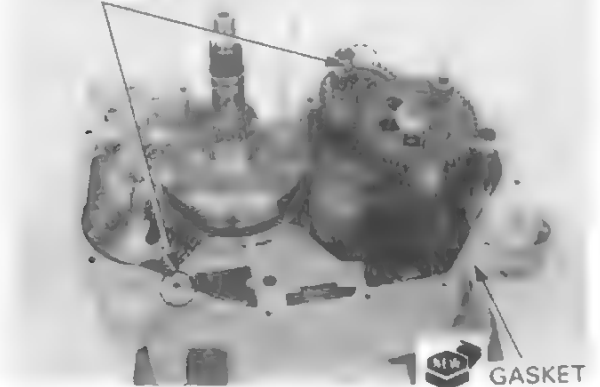


TIMING MARKS

## CRANKCASE ASSEMBLY

Install the dowel pins and new gasket.

DOWEL PINS



GASKET



## CRANKSHAFT/BALANCER/TRANSMISSION

Install the front crankcase onto the rear crankcase.

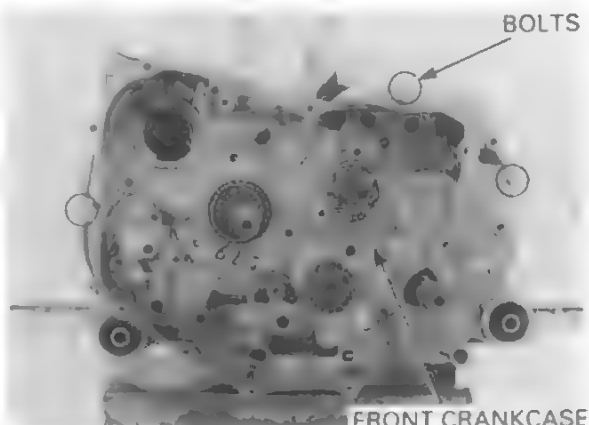
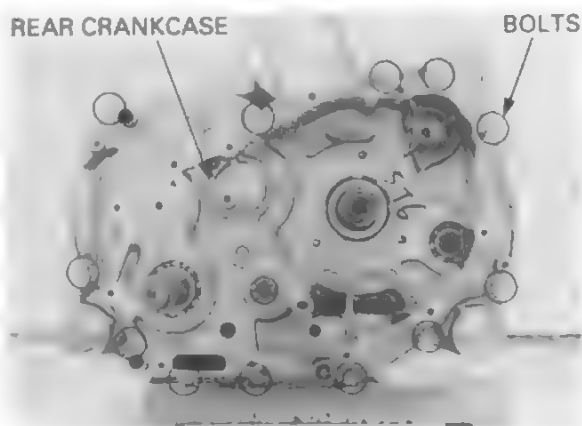
**NOTE:**

- Make sure that the gasket stays in place.
- Make sure the bearing holder/cam chain tensioner arm is on the correct side of the mainshaft. Refer to page 7-23 for proper positioning.
- Make sure that the oil pump shaft is correctly aligned.

Install and tighten all the rear crankcase bolts in 2 or 3 steps in a crisscross pattern.

Tighten the front crankcase bolts.

Install the new O-ring onto the final drive shaft.

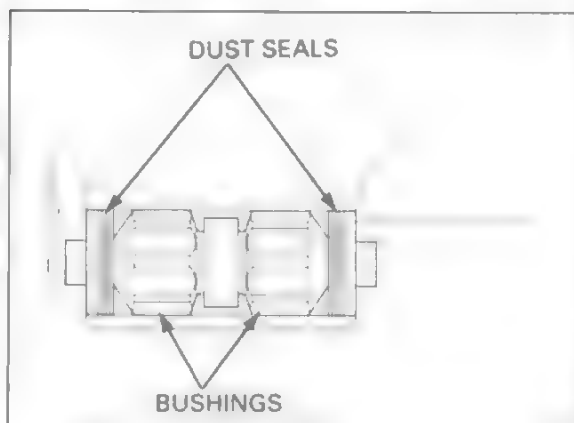


Install the engine hanger bushings and dust seals.

**NOTE:**

When installing the engine hanger bushing dust seals, install the dust seal lips to the outside as shown.

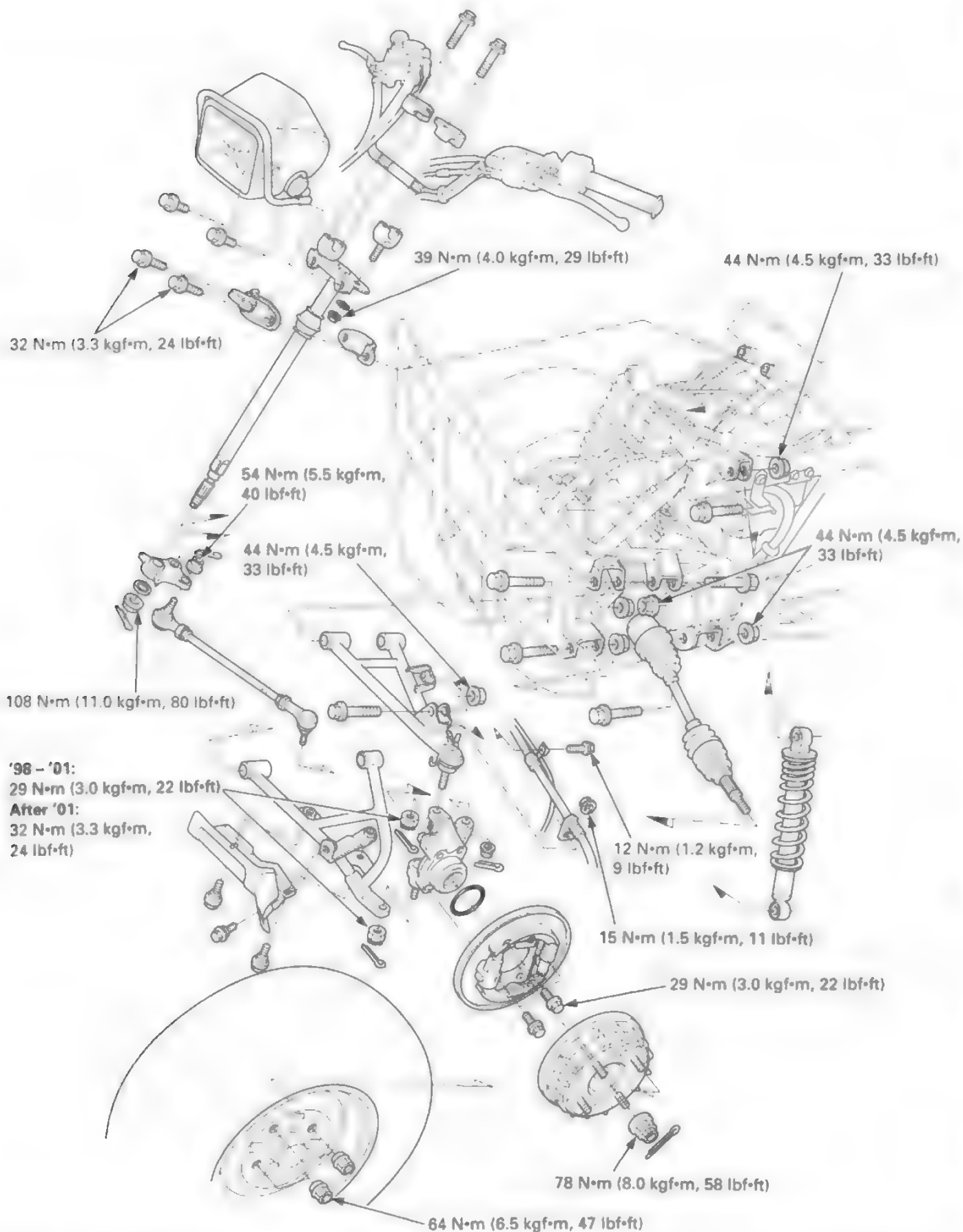
Reinstall the removed parts in the reverse order of removal.



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MEMO

# FRONT WHEEL/SUSPENSION/STEERING



# 12. FRONT WHEEL/SUSPENSION/STEERING

SERVICE INFORMATION	12-1	TIRES	12-8
TROUBLESHOOTING	12-2	TIE-ROD/KNUCKLE	12-12
HANDLEBAR	12-3	UPPER/LOWER ARMS	12-20
THROTTLE HOUSING	12-6	STEERING SHAFT	<u>12-23</u>
FRONT WHEEL	12-8	FRONT SHOCK ABSORBER	12-29

## SERVICE INFORMATION

### GENERAL

#### ⚠ WARNING

*A contaminated brake drum or shoe reduces stopping power. Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.*

- A jack or other support is required to support the vehicle.
- Adjust toe whenever the tie-rod, knuckle or steering shaft are replaced or removed (page 3-22).
- Do not twist or bend the brake hoses and pipes when removing them from the knuckle or upper arm.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Minimum tire tread depth		—	4 (0.2)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
Tie-rod distance between the ball joints		369 ± 1 (14.5 ± 0.04)	—
Toe		Toe-out: 35 ± 15 mm (1-3/8 ± 9/16 in)	—

### TORQUE VALUES

Handlebar lower holder nut	39 N·m (4.0 kgf·m, 29 lbf·ft)	Do not reuse; replace with a new one.
Steering shaft U-nut	108 N·m (11.0 kgf·m, 80 lbf·ft)	U-nut
Tie-rod ball joint self lock nut	54 N·m (5.5 kgf·m, 40 lbf·ft)	Do not reuse; replace with a new one.
Tie-rod lock nut	54 N·m (5.5 kgf·m, 40 lbf·ft)	
Steering shaft holder flange bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	
Upper lower arm pivot self lock nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Do not reuse; replace with a new one.
Knuckle ball joint castle nut ('98 - '01) (After '01)	29 N·m (3.0 kgf·m, 22 lbf·ft)	Castle nut
	32 N·m (3.3 kgf·m, 24 lbf·ft)	Castle nut
Shock absorber upper mounting self lock nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Do not reuse; replace with a new one.
Shock absorber lower mounting self lock nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Do not reuse; replace with a new one.
Front wheel hub castle nut	78 N·m (8.0 kgf·m, 58 lbf·ft)	Castle nut
Front wheel nut	64 N·m (6.5 kgf·m, 47 lbf·ft)	
Throttle case cover	4 N·m (0.4 kgf·m, 2.9 lbf·ft)	
Brake hose 2 way joint nut	15 N·m (1.5 kgf·m, 11 lbf·ft)	
Brake hose clamp bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Brake panel bolt	29 N·m (3.0 kgf·m, 22 lbf·ft)	Do not reuse; replace with a new one.

## FRONT WHEEL/SUSPENSION/STEERING

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### TOOLS

Universal bead breaker	GN-AH-958-BB1
Ball joint remover	07MAC-SL00200
Oil seal driver attachment	07JAD-PH80101
Driver	07949-3710001
Attachment	07945-3330300 or 07746-0010400
Driver	07749-0010000
Attachment, 37 X 40 mm	07746-0010200
Attachment, 52 X 55 mm	07746-0010400
Pilot, 30 mm	07746-0040700
Pilot, 20 mm	07746-0040500
Ball joint remover/installer	07WMF-HN00100
Attachment, 28 X 30 mm	07946-1870100
Ball joint installer base	07HAF-SF10120

### TROUBLESHOOTING

#### Hard steering

- Damaged steering shaft bearing and holder bushing
- Steering shaft holder too tight
- Insufficient tire pressure

#### Steers to one side or does not track straight

- Bent tie-rod
- Insufficient tire pressure
- Bent suspension arm; frame or wheel installed incorrectly
- Incorrect wheel alignment
- Weak front shock absorber

#### Front wheel wobbling

- Bent rim
- Worn front drum bearing
- Faulty tire
- Axle nut not tightened properly

#### Soft suspension

- Weak spring

#### Hard suspension

- Bent shock absorber

#### Suspension noise

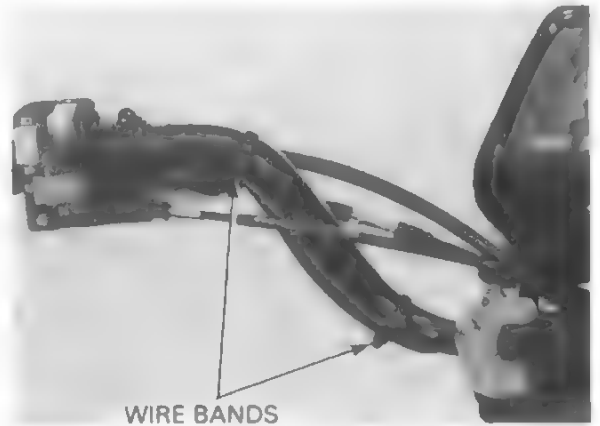
- Loose fasteners

## HANDLEBAR

### REMOVAL

Remove the front fender and handlebar cover (section 2).

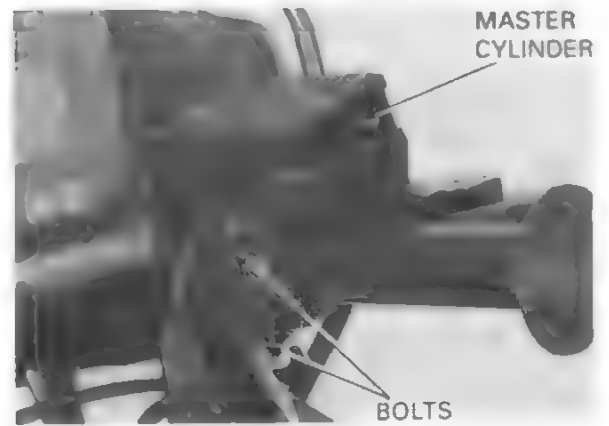
Remove the wire bands.



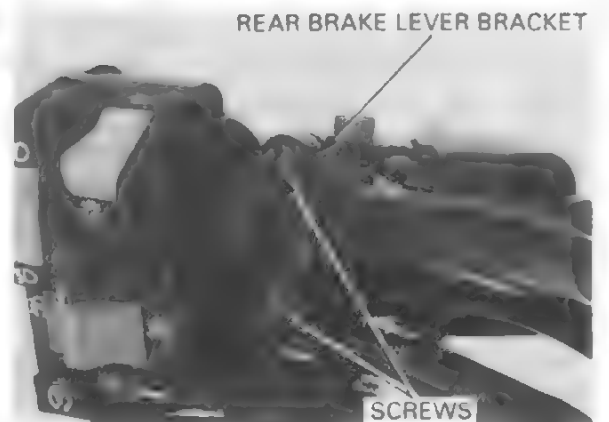
Remove the two screws and throttle housing.



Remove the two bolts and master cylinder.



Remove the two screws and rear brake lever bracket.



## FRONT WHEEL/SUSPENSION/STEERING

Remove the two screws and switch housing.

*TRX450S/FM  
only*

Disconnect the choke cable.

SWITCH HOUSING



Remove the four bolts and upper holders.

Remove the handlebar.

UPPER HOLDERS

BOLTS



### INSTALLATION

Place the handlebar on the lower holders.  
Align the punch mark on the handlebar with the top of the lower holders.  
Install the upper holders on the handlebar with their cover bosses forward.  
Tighten the front bolts first, then tighten the rear bolts.

UPPER HOLDERS

BOLTS



PUNCH MARK

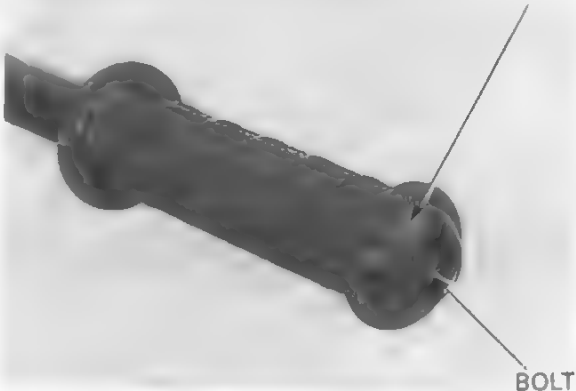
If the handlebar grips were removed, apply Honda Bond A or Honda Hand Grip Cement (U.S.A. only) to the inside of the grip and to the clean surfaces of the right and left handlebar.

Wait 3-5 minutes and install the grip.  
Rotate the grip for even application of the adhesive.

*Allow the adhesive  
to dry for an hour  
before using.*

Install the grip end and tighten the bolt.

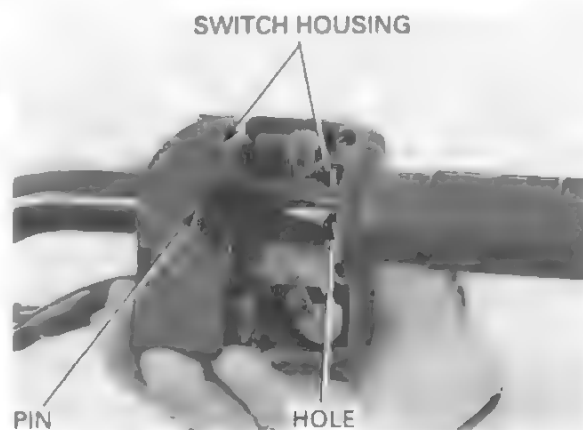
GRIP END



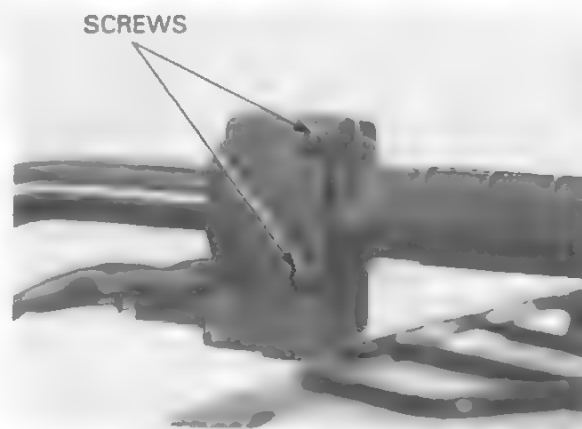
BOLT

**TRX450S/FM only** Connect the choke cable to the choke lever.

Install the left handlebar switch by aligning its locating pin with the hole in the handlebar.

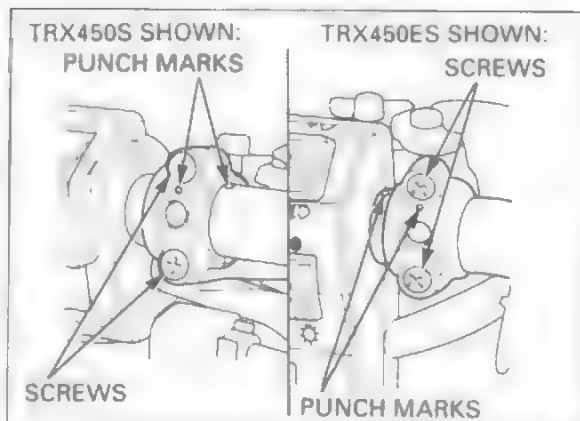


Tighten the upper screw first, then the lower screw.



Install the rear brake lever bracket with the punch mark on the holder facing up. Align the end of the holder with the punch mark on the handlebar.

Tighten the upper screw first, then the lower screw.

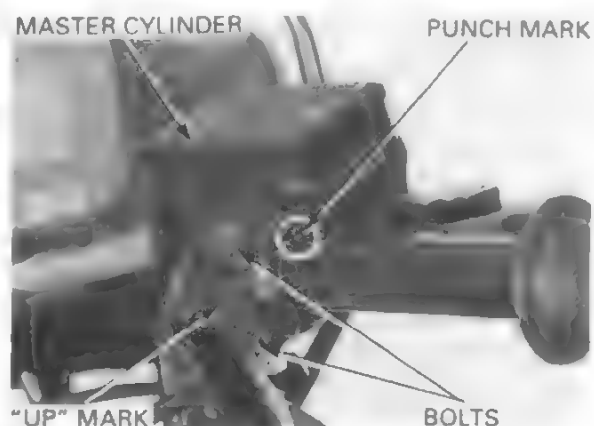


Install the master cylinder by aligning the end of the master cylinder with the punch mark on the handlebar.

Install the master cylinder holder with the "UP" mark facing up.

Tighten the upper bolt first, then the lower bolt.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**





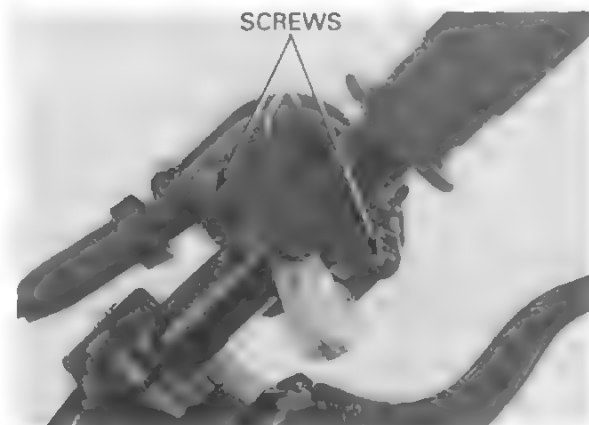
## FRONT WHEEL/SUSPENSION/STEERING

Install the throttle housing by aligning the line on the throttle housing with the end of the master cylinder.

### THROTTLE HOUSING

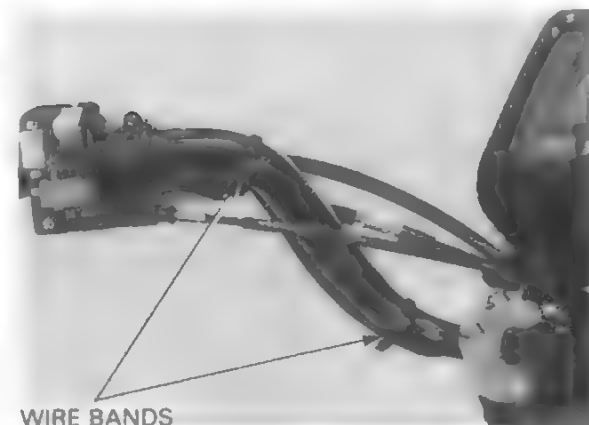


Tighten the throttle housing screws securely.



Secure the wire with the wire bands.

Install the handlebar cover and front fender (section 2).



## THROTTLE HOUSING

### DISASSEMBLY

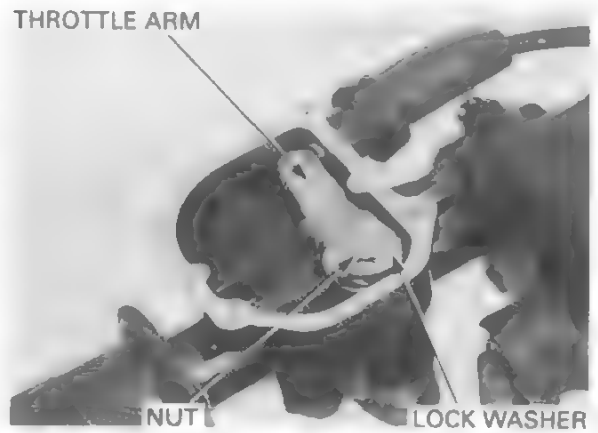
Remove the three throttle housing cover screws and the cover.  
Remove the gasket.



Slide the rubber boot off the cable adjuster.  
Loosen the throttle cable adjuster.

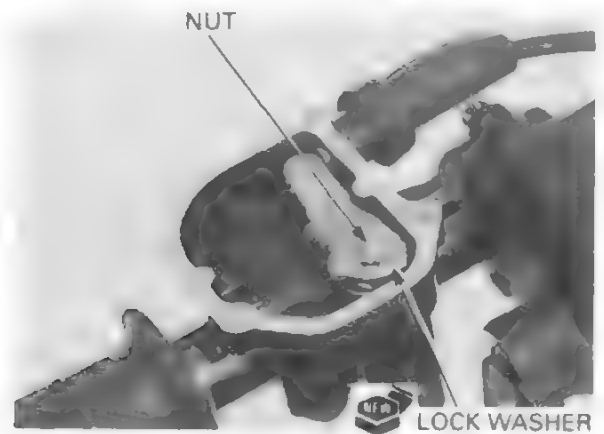
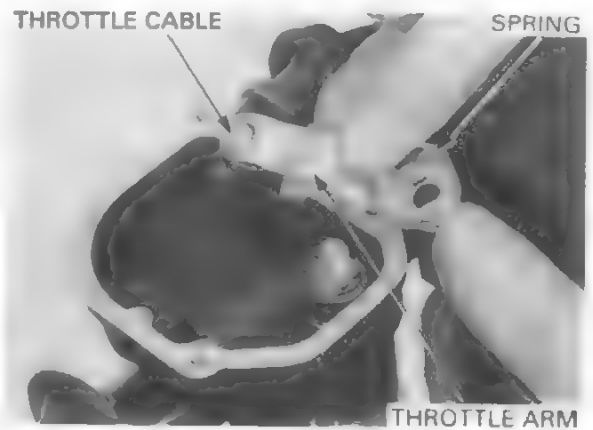
Bend down the lock washer tab and remove the nut and lock washer.

Disconnect the throttle cable from the throttle arm.  
Remove the throttle arm, spring and throttle lever from the throttle housing.



## ASSEMBLY

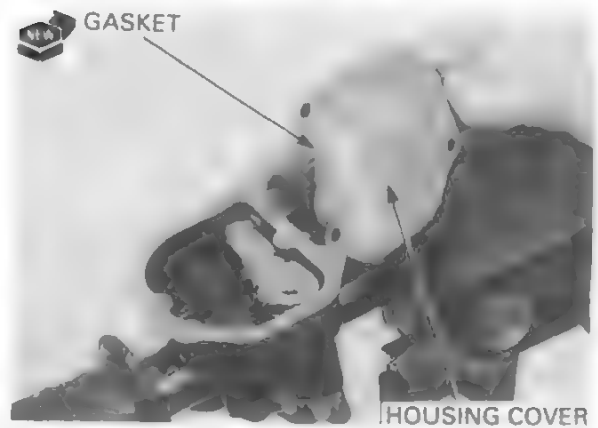
Connect the throttle cable to the throttle arm.  
Install the throttle arm spring and arm onto the throttle lever by aligning the slot.



Install a new gasket, then install the throttle housing cover.

Install and tighten the three screws.

Adjust the throttle lever free play (page 3-4).

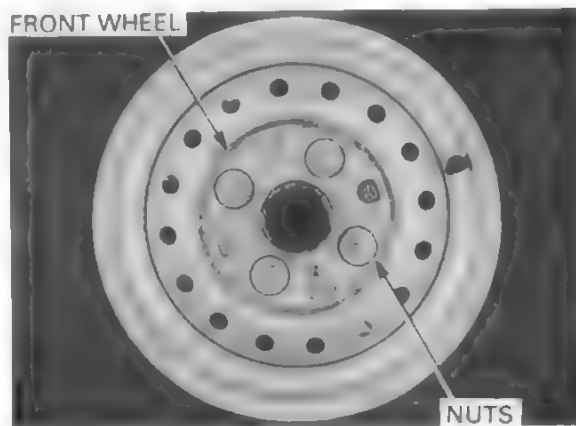


### FRONT WHEEL

#### REMOVAL

Loosen the wheel nuts.  
Place a support block under the engine to raise the front wheels off the ground.

Remove the wheel nuts and wheel.



#### INSTALLATION

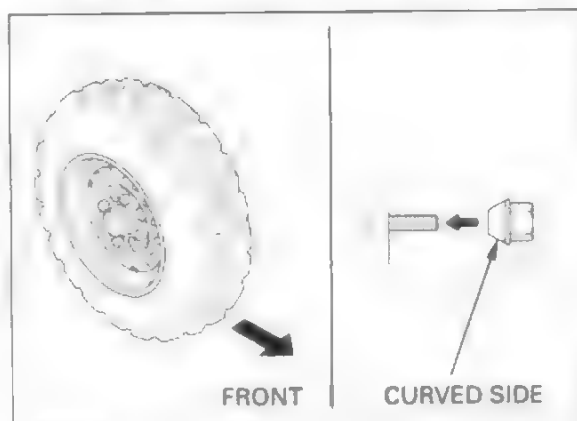
Install the front wheel.

##### NOTE:

Do not interchange the right and left tires.

Install the wheel nuts with their curved (tapered) sides facing inward and tighten to the specified torque.

**TORQUE:** 64 N·m (6.5 kgf·m, 47 lbf·ft)



### TIRES

#### REMOVAL

##### NOTE:

- This service requires the Universal Bead Breaker (GN-AH-958-BB1).
- Remove and install tires from the rim side opposite the valve stem.

Remove the core from the valve stem.

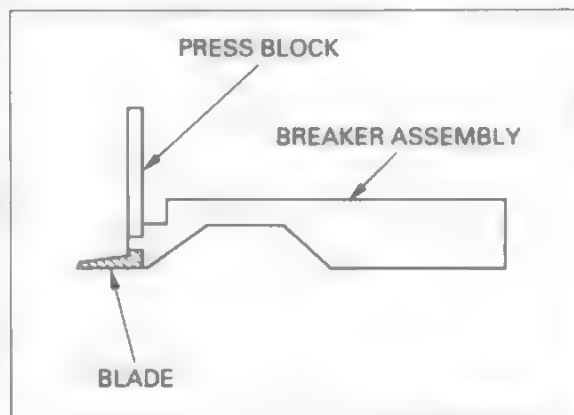
##### CAUTION:

- Use of the bead breaker tool is required for tire removal.
- Do not damage the bead seating area of the rim.
- Use a Coats 220 Tire Changer or equivalent to remove the tire from the rim. If a tire changer is not available, rim protectors and tire irons may be used.

Install the blade for 9/11" rims onto the breaker arm assembly. Slide a piece of 1 1/2" I.D. x 8" length rectangular tubing over the end of the breaker assembly.

##### CAUTION:

Use of an improper size blade may result in damage to the rim, tire or blade.



Place the proper size adapter onto the threaded shaft and then put the wheel over the threaded shaft and adapter.

Lube the bead area with water, pressing down on the tire sidewall/bead area in several places to allow the water to run into and around the bead. Also lube area where the breaker arm will contact the sidewall of the tire.

## ⚠ WARNING

**Use only water as a lubricant removing or mounting tires.**

**Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.**

While holding the breaker arm assembly at an approximate 45° position, insert the blade of the breaker arm between the tire and rim. Push the breaker arm inward and downward until it is in the horizontal position with its press block in contact with the rim.

With the breaker arm in the horizontal position, place the breaker press head assembly over the breaker arm press block. Make sure the press head bolt is backed out all the way and then position the nylon buttons on the press head against the inside edge of the rim.

Insert the threaded shaft through the #11 hole in the breaker press head assembly and then tighten the lever nut until both ends of the breaker press head assembly are in firm contact with the rim.

Tighten the press head bolt until the reference mark on the press block is aligned with the top edge of the press head.

If the rest of the bead cannot be pushed down into the center of the rim by hand, loosen the press head bolt and the lever nut.

Rotate the breaker arm assembly and breaker press head assembly 1/8 to 1/4 the circumference of the rim.

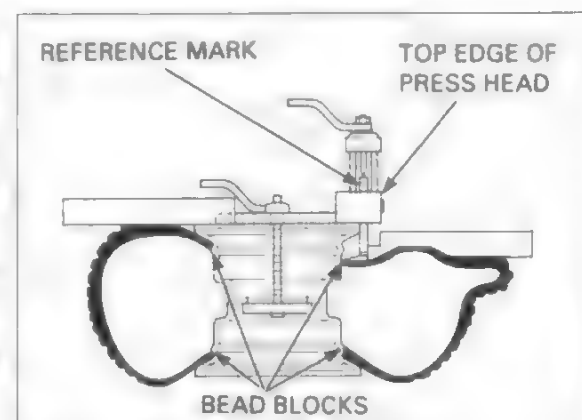
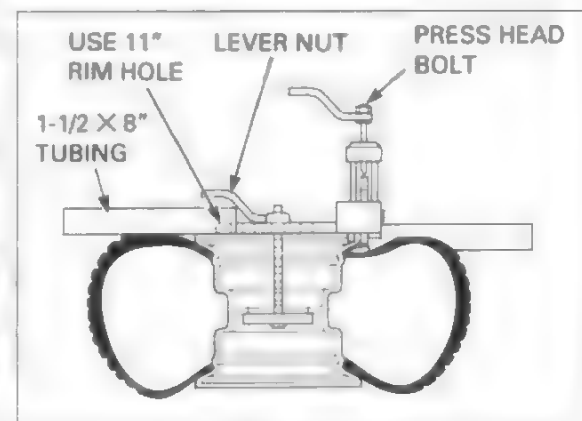
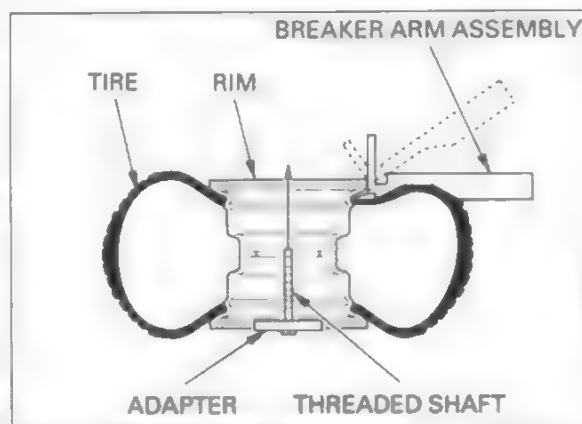
Tighten the lever nut and then tighten the press head bolt as described.

Repeat this procedure as necessary until the remainder of the bead can be pushed down into the center of the rim.

Assemble the Universal Bead Breaker on the other side of the wheel and break the bead following the same procedures.

Remove the tire from the rim using a tire changer machine or tire irons and rim protectors.

Remove tire from the rim side that has the smallest shoulder area to simplify removal.



### TIRE REPAIR

#### NOTE:

Use the manufacturer's instructions for the tire repair kit you are using. If your kit does not have instructions, use the procedures provided here.

Check the tire for foreign objects.

Chalk mark the punctured area and remove the foreign object.

Inspect and measure the injury.

Tire repairs for injuries larger than 15 mm (5/8 in) should be a section repair.

Section repairs should be done by a professional tire repair shop.

If the injury is smaller than 15 mm (5/8 in), proceed with the repair as described here.

Install a rubber plug into the injury as follows:

Apply a cement to a plug inserting needle and work the needle into the injury to clean and lubricate it. Do this three times.

Do not let the cement dry.

Insert and center a rubber plug through the eye of the inserting needle.

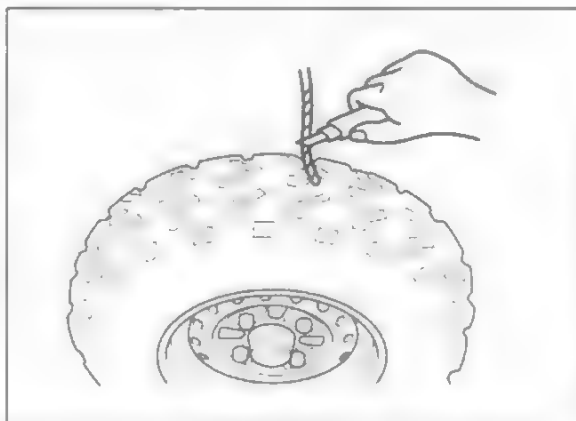
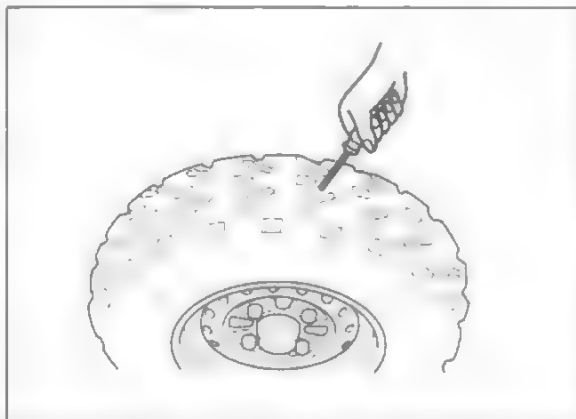
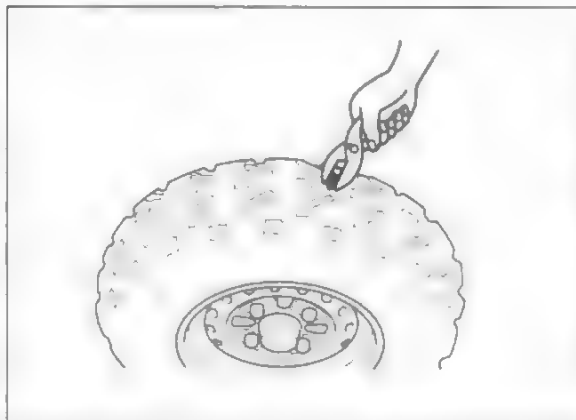
Apply cement to the rubber plug.

Push the inserting needle with plug into the injury until the plug is slightly above the tire.

Twist the needle and remove it from the tire; the plug will stay in the tire.

Trim the plug 6 mm (1/4 in) above the tire surface. Repeat the above procedure if the puncture is large. Do not use more than two plugs per injury.

*Be careful not to push the plug all the way into the tire to prevent it from falling inside.*



Allow the repair to dry . Drying time will vary with air temperature. Refer to the tire repair kit manufacturer's recommendations.

Inflate the tire and test the seal by dabbing a small amount of cement around the plug. Escaping air will cause a bubble in the cement. If there is leakage, remove the tire (page 12-9) and apply a cold patch to the inside of the tire as described.

If a plug has been inserted, trim it even with the inner tire surface.

Temporarily place a rubber patch that is at least twice the size of the puncture over the injury. Make a mark around the patch, slightly larger than the patch itself.

Roughen the area marked inside the tire with a tire buffer or a wire brush. Clean the rubber dust from the buffed area.

Apply cement over the area marked and allow it to dry.

Remove the lining from the patch and center it over the injury.

Press the patch against the injury using a special roller.

## NOTE:

- Allow cement to dry until tacky before applying patch.
- Do not touch the cement with dirty or greasy hands.

## ASSEMBLY

Install the tire onto the rim, where the rim shoulder width is the narrowest, to simplify installation.

Clean the rim bead seat and flanges.

Apply clean water to the rim flanges, bead seat and base.

## ⚠ WARNING

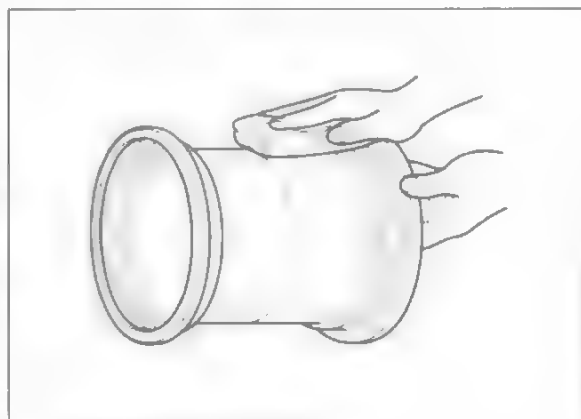
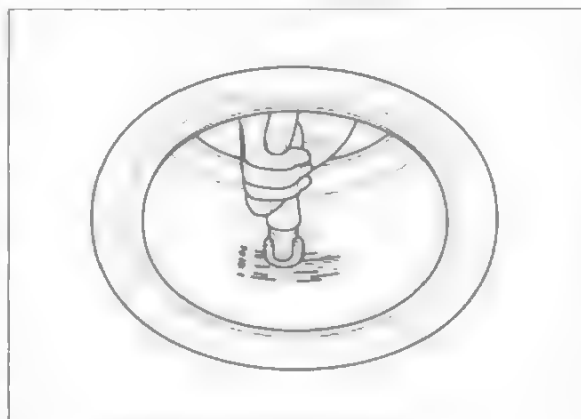
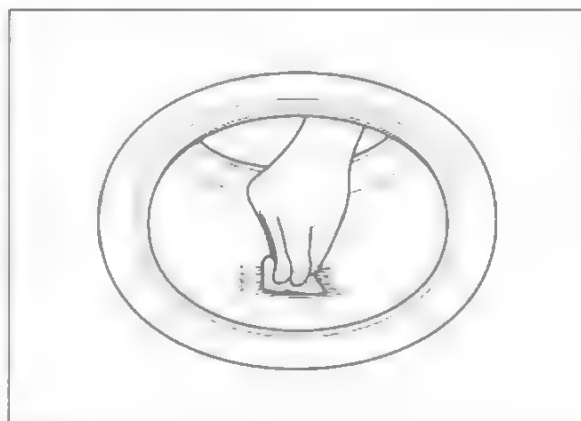
*Use only water as a lubricant when mounting tires. Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.*

Install the valve core in the valve stem.

Install the tire and inflate it to seat the tire bead.

Deflate the tire. Wait 1 hour and inflate the tire to the specified pressure.

Check for air leaks and install the valve cap.



## Tire pressure:

	FRONT/REAR
Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)
Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)
With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)

### TIE-ROD/KNUCKLE

#### REMOVAL

##### NOTE:

The tie-rod can be removed without removing the brake drum.

Remove the front wheel (page 12-8).  
Remove the two bolts.  
Remove the brake drum.

Remove the following:

- Cotter pin
- Axle nut
- Wheel hub

Remove the brake hose guide mounting nut.  
Remove the breather tube from the tube guides.

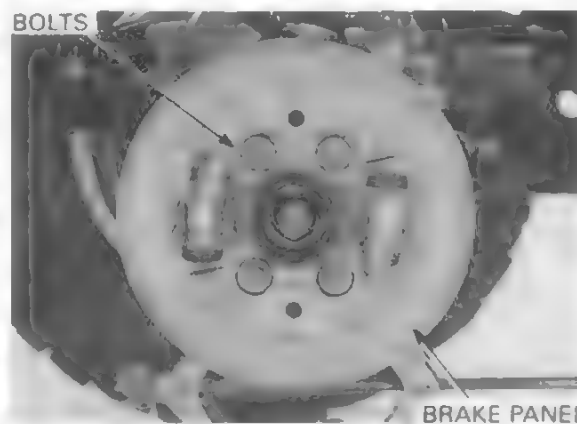
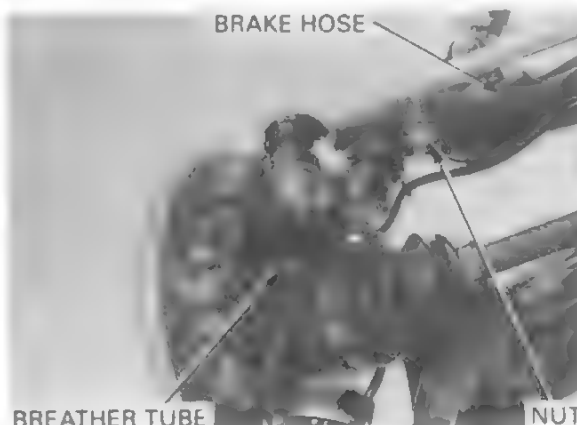
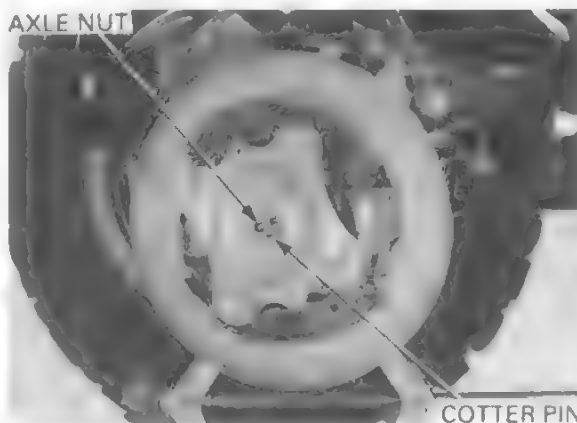
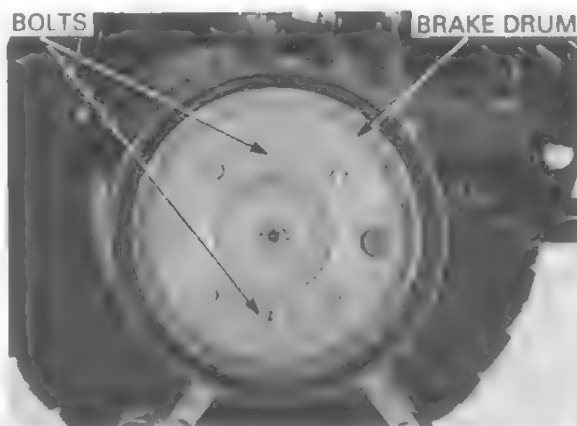
Remove the four bolts and brake panel from the knuckle.

##### NOTE:

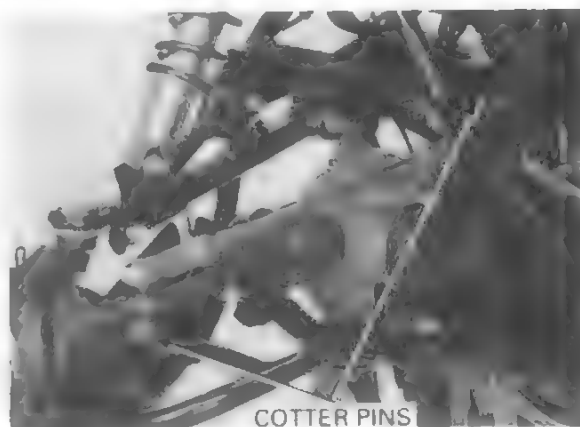
- Do not disconnect the brake hose from the brake panel.  
The brake system will have to be bled if the brake hose is disconnected.
- Do not operate the front brake lever after removing the brake panel. If you do, the pistons will be forced from the cylinder.

##### CAUTION:

*Support the brake panel so that it does not hang from the brake hose. Do not twist the brake hose.*



Remove the cotter pins.

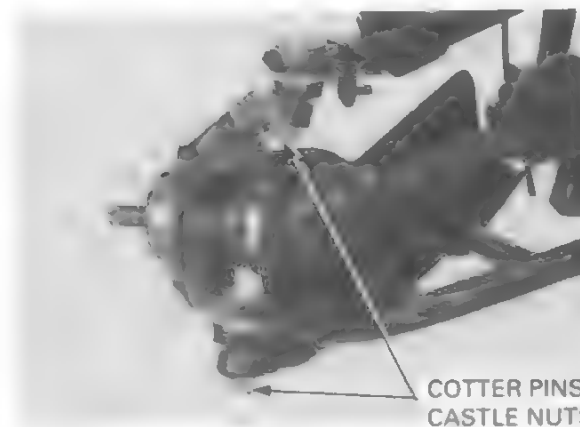


Hold the tie-rod joints and remove the nuts.

Remove the tie-rod.



Remove the cotter pins.  
Loosen the castle nuts, but do not remove them.



Apply grease to the ball joint puller on the are as shown.

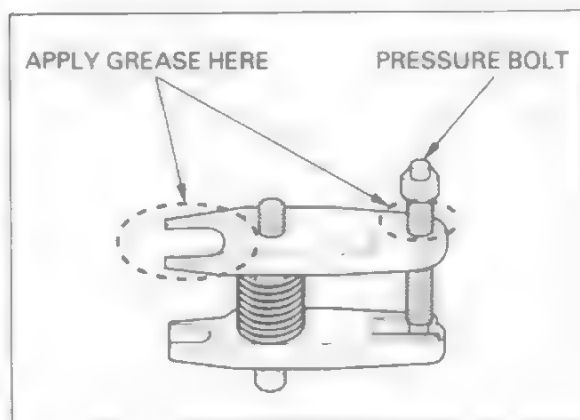
This will ease installation of the tool and prevent damage to the pressure bolt threads.

Insert the jaws carefully, making sure that you do not damage the ball joint boot.

Adjust the jaw spacing by turning the pressure bolt.

**NOTE:**

If necessary, apply penetrating type lubricant to loosen the ball joint.

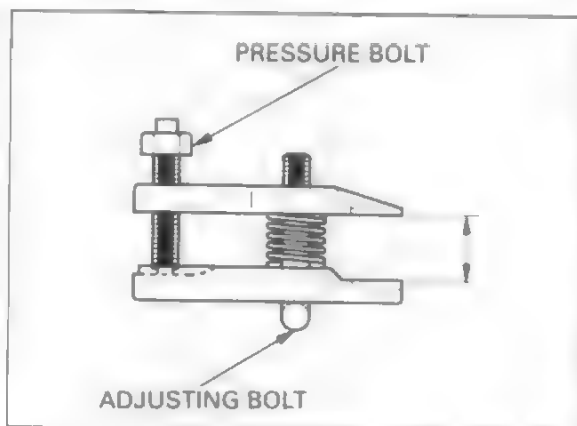




## FRONT WHEEL/SUSPENSION/STEERING

Once the tool is in place, turn the adjusting bolt as necessary to make the jaws parallel. Then hand-tighten the pressure bolt and recheck the jaws to make sure they are still parallel.

Tighten the pressure bolt with a wrench until the ball joint shaft pops loose.



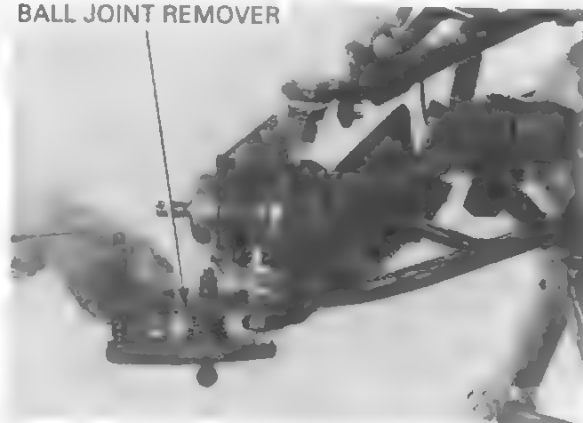
Remove the knuckle from the upper and lower arm, using the special tool according to the above instructions.

### TOOL:

Ball joint remover, 28 mm 07MAC-SL00200

Remove the castle nuts.

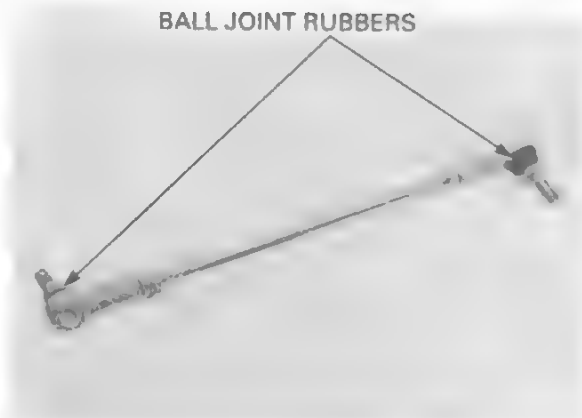
BALL JOINT REMOVER



## INSPECTION

Inspect the tie-rod for distortion or damage. Inspect the ball joint rubbers for tears or other damage by moving the ball joint ends. They should move freely and smoothly. Replace the ball joints if necessary.

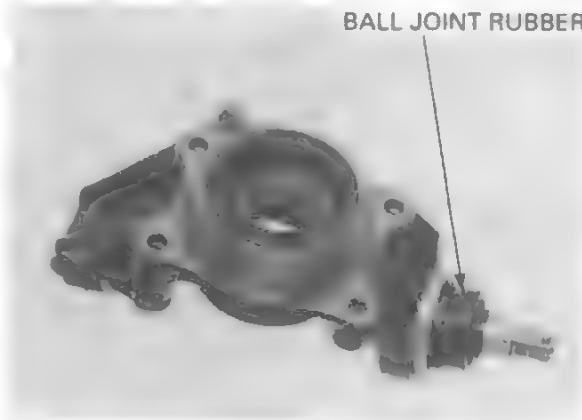
BALL JOINT RUBBERS



Inspect the knuckle for damage or cracking.

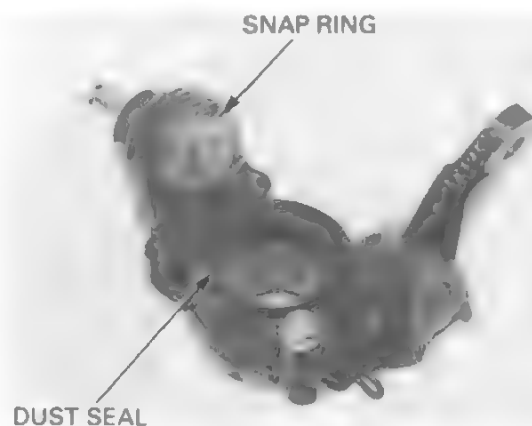
Inspect the knuckle ball joint rubber for tears or other damage by moving the ball joint end. It should move freely and smoothly. Replace the ball joint if necessary.

BALL JOINT RUBBER



## BALL JOINT REPLACEMENT

Remove the snap ring and dust seal.

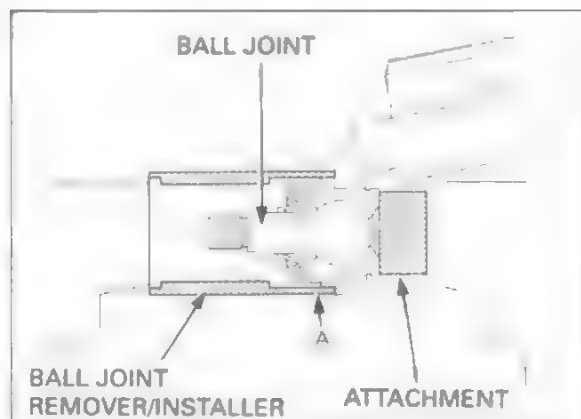


Set the knuckle and special tools, with "A" marked side on the tool facing the ball joint, in a vise as shown.

### TOOL:

Ball joint remover/installer 07WMF-HN00100  
Attachment, 28 X 30 07946-1870100

Press the ball joint out of the knuckle by tightening the vise.



Set the knuckle, a new ball joint and special tools, with "B" marked side on the tool faced to the ball joint, in a vise as shown.

### TOOL:

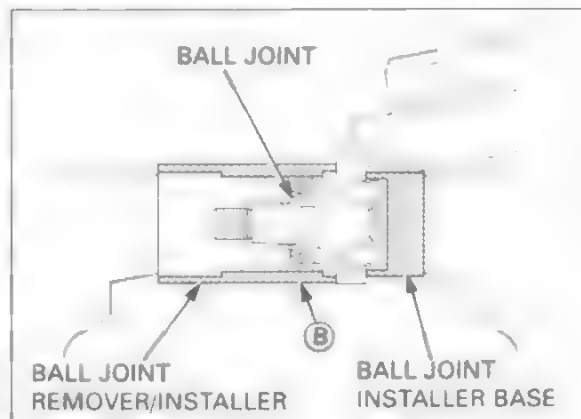
Ball joint remover/installer 07WMF-HN00100  
Ball joint installer base 07HAF-SF10120

Press the ball joint into the knuckle by tightening a vise as shown.

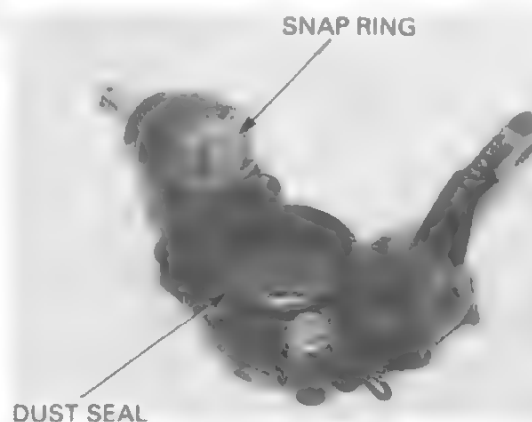
### CAUTION:

*If you feel the ball joint head pressing against the vise, stop tightening.*

*Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try retighten.*



Install the snap ring securely in the ball joint groove.  
Install the dust seal (page 12-17).



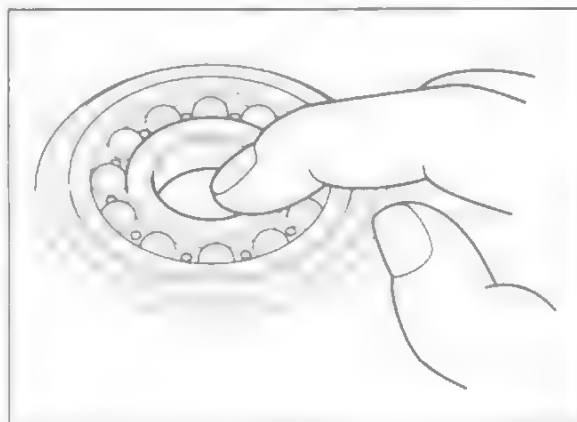
### KNUCKLE BEARING INSPECTION/ REPLACEMENT

Turn the inner race of the knuckle bearing with your finger.

The bearing should turn quietly.

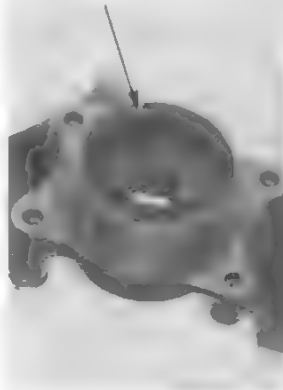
Also check that the bearing outer race fits tightly in the knuckle.

Remove and discard the bearing if the race does not turn smoothly and quietly or if it fits loosely in the knuckle.



Remove both dust seals from the knuckle.

OUTER DUST SEAL



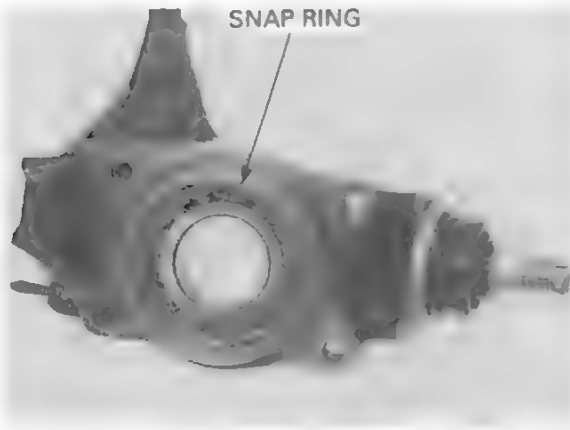
INNER DUST SEAL



Remove the snap ring.

Drive the bearing out of the knuckle.

SNAP RING



Pack the new bearing cavity with grease.  
Install the bearing squarely.

#### TOOLS:

Driver

Attachment

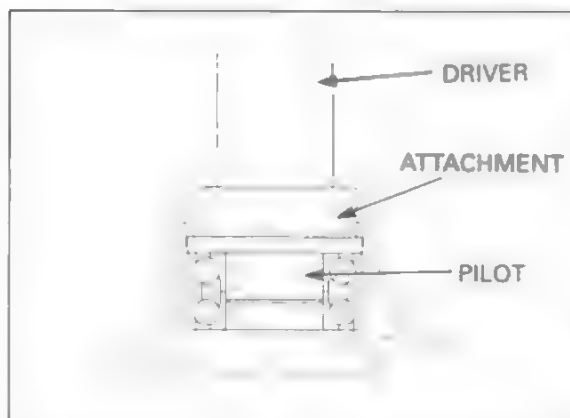
Pilot, 30 mm

07749-0010000

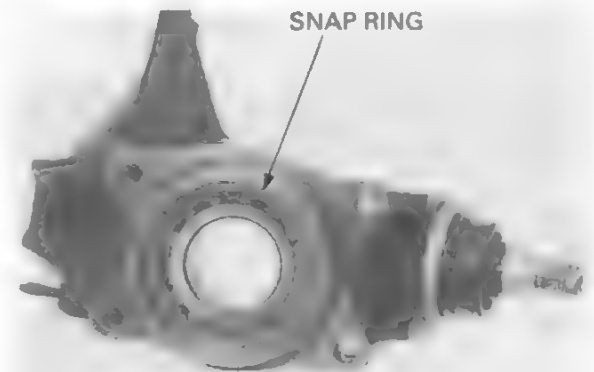
07945-3330300 or

07746-0010400

07746-0040700



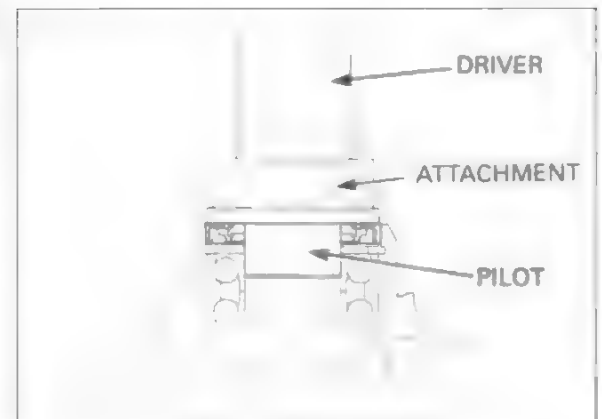
Install a snap ring securely in the knuckle groove.



Install new outer dust seals using the special tools.  
Apply grease to the dust seal lips.

**TOOLS:**

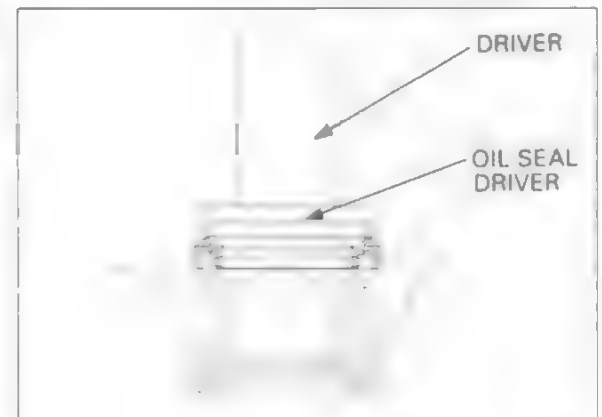
<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 52 X 55 mm</b>	<b>07746-0010400</b>
<b>Pilot, 30 mm</b>	<b>07746-0040700</b>



Install new inner dust seals using the special tools.  
Apply grease to the dust seal lips.

**TOOLS:**

<b>Driver</b>	<b>07749-0010000</b>
<b>Oil seal driver</b>	<b>07JAD-PH80101</b>
<b>Pilot, 30 mm</b>	<b>07746-0040700</b>



### TIE-ROD ASSEMBLY

Install the unmarked ball joint and gold colored nut on the flat side of the tie-rod, and the "L" marked ball joint and silver nut on the opposite side.

Set the distance between the ball joints as specified below.

#### STANDARD SETTING:

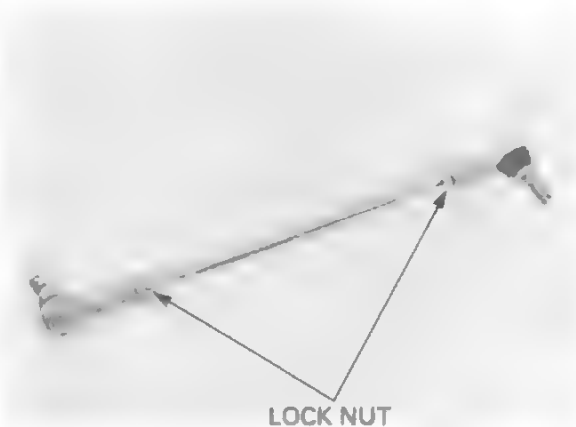
##### LOCK NUT-TO-THREAD END DISTANCE A AND B:

A: '98 - '01: 3.5 mm (0.14 in), After '01: 5.5 mm (0.22 in)

B: '98 - '01: 3.5 mm, After '01: 5.5 mm (0.22 in)

A-B less than or equal to 3 mm (0.1 in)

Tighten the lock nuts securely.



### KNUCKLE INSTALLATION

Connect the knuckle to the upper arm.  
Install the castle nut.

Raise the upper arm and insert the drive shaft into the knuckle.

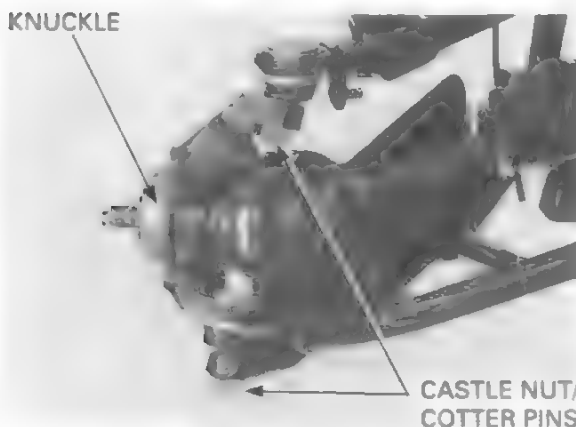
Connect the knuckle to the lower arm.  
Install the castle nut.

Tighten the castle nuts to the specified torque.

**TORQUE:** '98 - '01: 29 N·m (3.0 kgf·m, 22 lbf·ft)

After '01: 32 N·m (3.3 kgf·m, 24 lbf·ft)

Install the new cotter pins.



### TIE-ROD INSTALLATION

Install the tie-rod with its flat end at the knuckle.

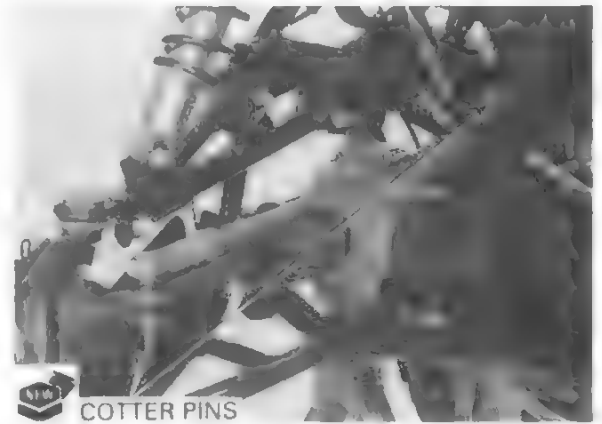
Hold the ball joint and tighten the ball joint nuts to the specified torque.

**TORQUE:** 54 N·m (5.5 kgf·m, 40 lbf·ft)



Install new cotter pins.

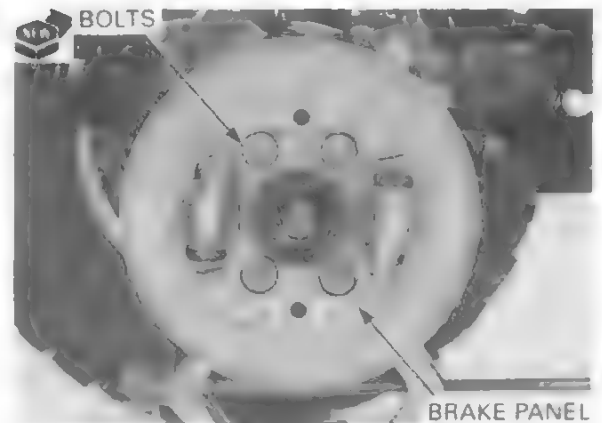
Adjust the toe (page 3-21).



If you removed the brake panel, install the brake panel onto the knuckle.

Install brake panel mounting bolts and tighten them to the specified torque.

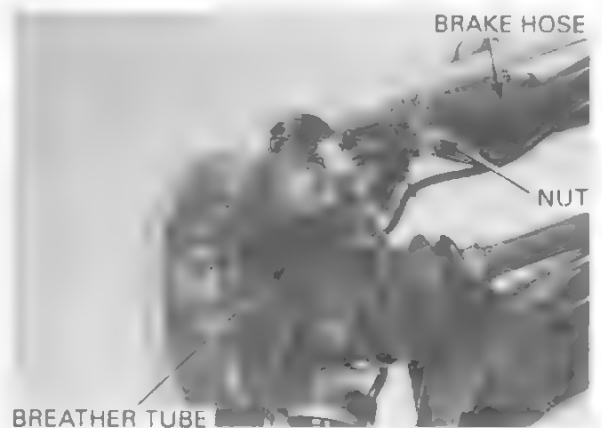
**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**



Clamp the breather tube into the clamps.

Install the brake hose clamps and tighten the nut.

**TORQUE: 15 N·m (1.5 kgf·m, 11 lbf·ft)**



Install the wheel hub.

Apply grease to the castle nut flange and threads, then install the nut.

Tighten the axle nut to the specified torque.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

Install a new cotter pin.

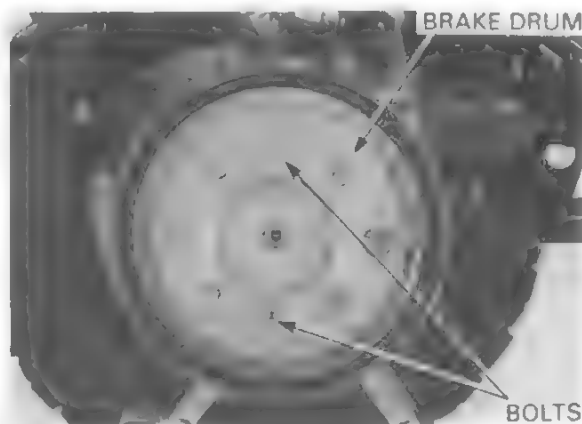
If you disconnect the brake line, bleed the system (page 14-3).

Install the front wheel (page 12-8).



## FRONT WHEEL/SUSPENSION/STEERING

Install the brake drum and tighten the two bolts.



## UPPER/LOWER ARMS

### REMOVAL

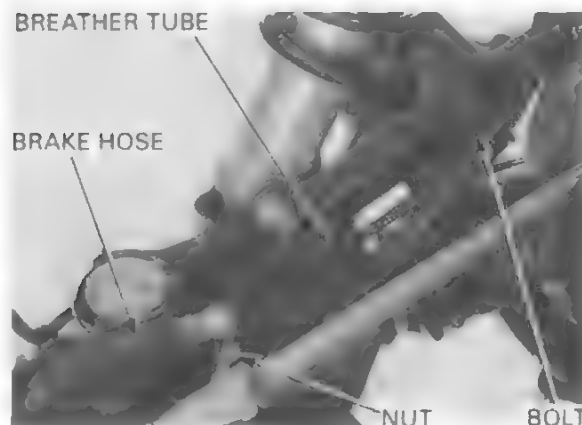
*The upper and lower arms can be removed without removing the tie-rod.*

Remove the knuckle (page 12-12).

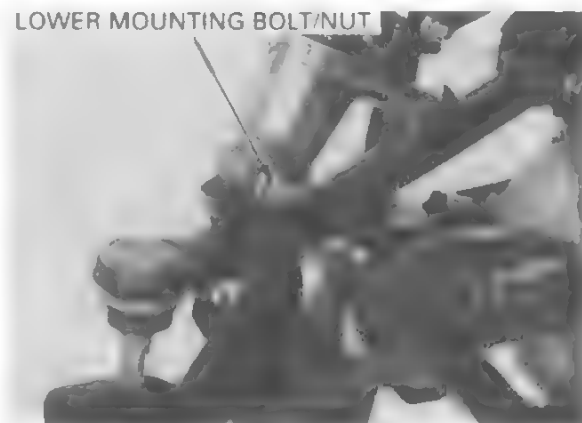
#### Upper Arm

Remove the brake hose guide mounting nut and bolt.

Remove the breather tube from the tube guides.



Remove the shock absorber lower mounting bolt/nut.



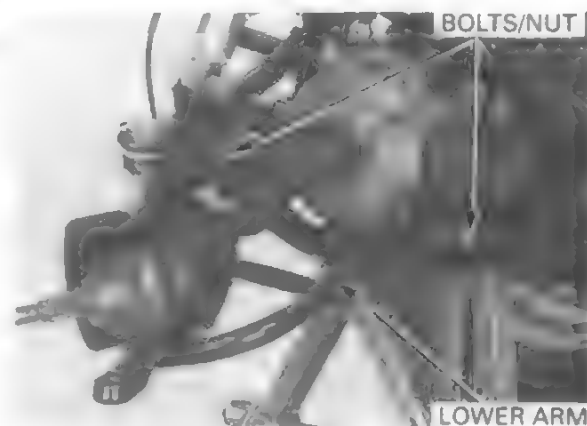
Remove the upper arm mounting bolts/nuts and arm.  
Discard the upper arm mounting nuts and shock absorber mounting nut.



## Lower Arm

Remove the lower arm mounting bolts/nuts and arm.

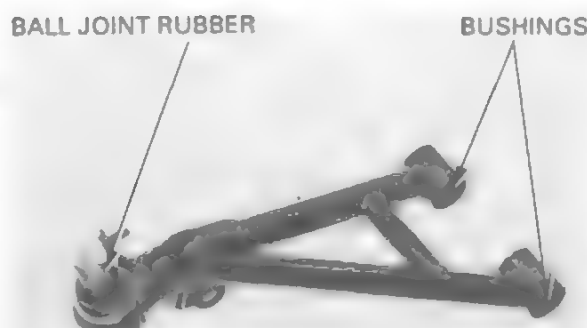
Discard the lower arm mounting nuts.



## INSPECTION

Inspect the ball joint rubber for tears or other damage by moving the ball joint end. It should move freely and smoothly. Check the pivot bushing for damage.

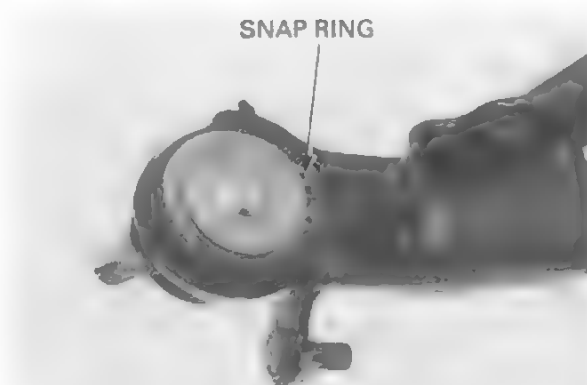
Replace the ball joint if necessary.



## BALL JOINT REPLACEMENT

### Upper Arm

Remove the snap ring.

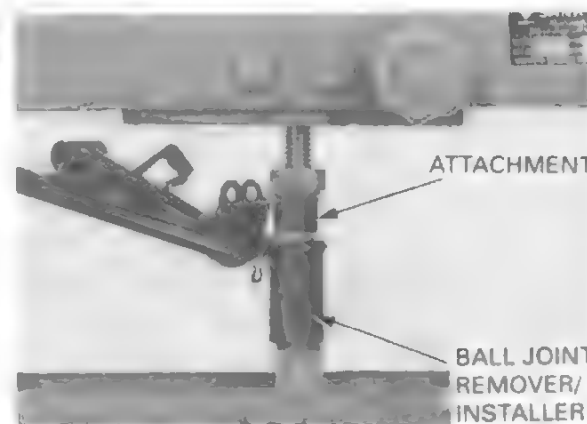


Set the upper arm and ball joint remover/installer with the "A" marked side on the tool faced to the ball joint, in a press as shown.

### TOOL:

Ball joint remover/installer 07WMF-HN00100  
Attachment, 28 X 30 mm 07946-1870100

Press the ball joint out of the upper arm.





## FRONT WHEEL/SUSPENSION/STEERING

Set the upper arm, a new ball joint and ball joint remove/installer with the "B" marked side on the tool faced to the ball joint, in a press as shown.

### TOOLS:

Ball joint remover/installer 07WMF-HN00100

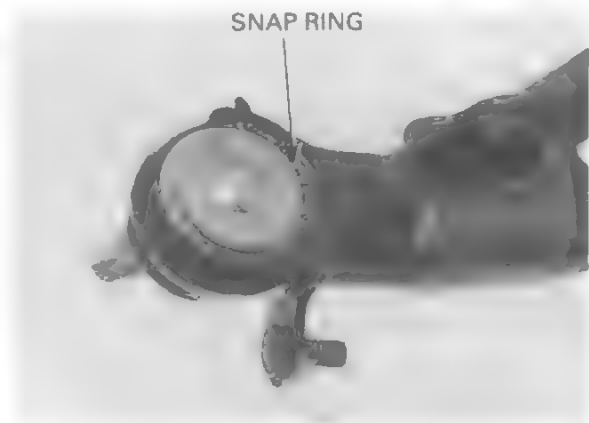
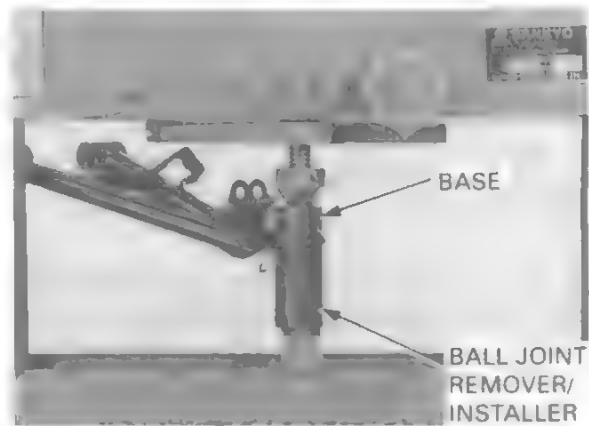
Ball joint installer base 07HAF-SF10120

Press the ball joint into the upper arm.

### CAUTION:

*If you feel strong resistance when lowering the press, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.*

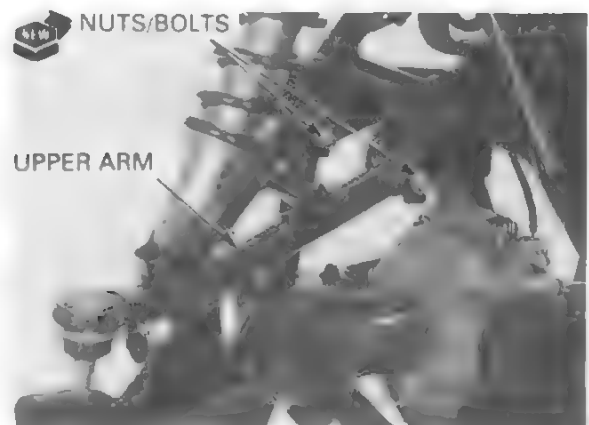
Install the snap ring to groove of the ball joint securely.



## INSTALLATION

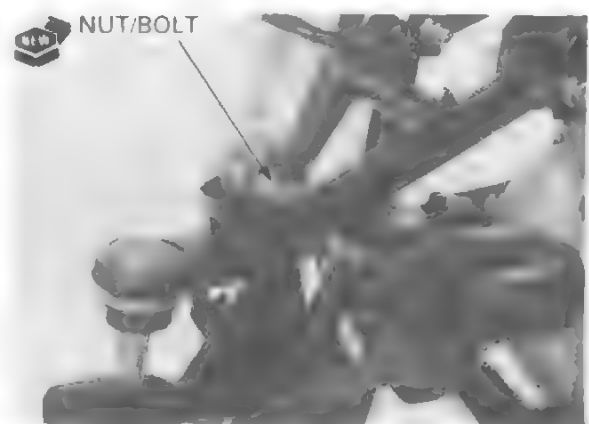
### Upper Arm

Install the upper arm, bolts and new nuts.



Install the shock absorber lower mounting bolt and new nut, then tighten it to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

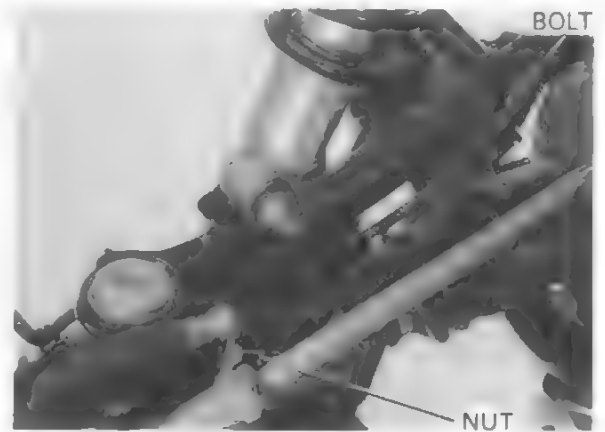


Install the knuckle (page 12-18).  
 Instal the brake hose and breather tube clamp.  
 Tighten the clamp bolt to the specified torque.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

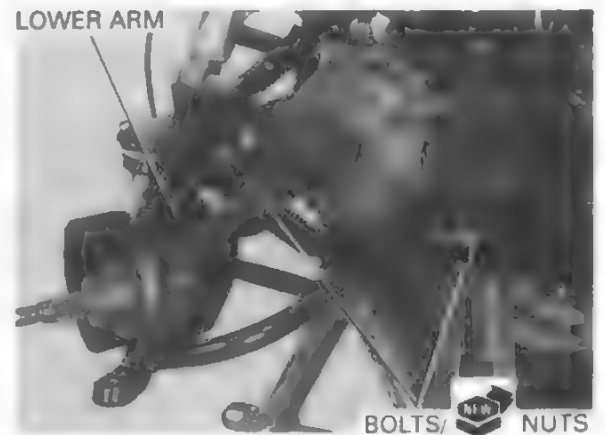
Install the brake hose clamp and tighten the nut.

**TORQUE: 15 N·m (1.5 kgf·m, 11 lbf·ft)**



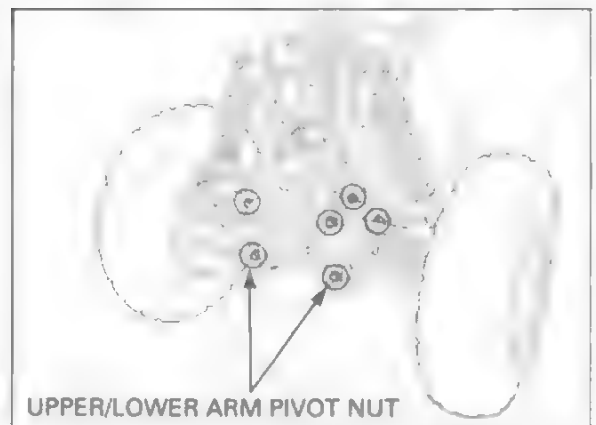
## Lower Arm

Install the lower arm, bolts and new nuts.



Install the front wheel (page 12-8), then place the vehicle on level ground.  
 Tighten the upper and lower arm mounting nuts to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

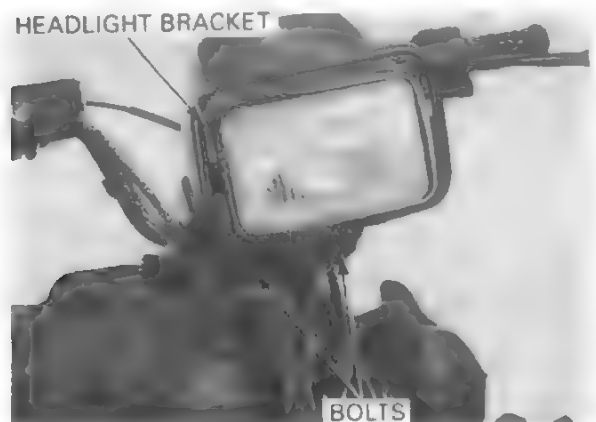


## STEERING SHAFT

### REMOVAL

Remove the front fender (page 2-6).

Remove the bolts and headlight bracket.

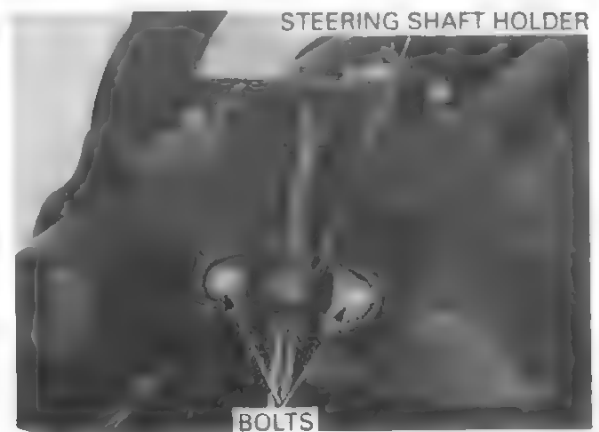


## FRONT WHEEL/SUSPENSION/STEERING

Remove the handlebar lower holder nuts, washers and handlebar assembly.  
Discard the handlebar lower holder nuts.

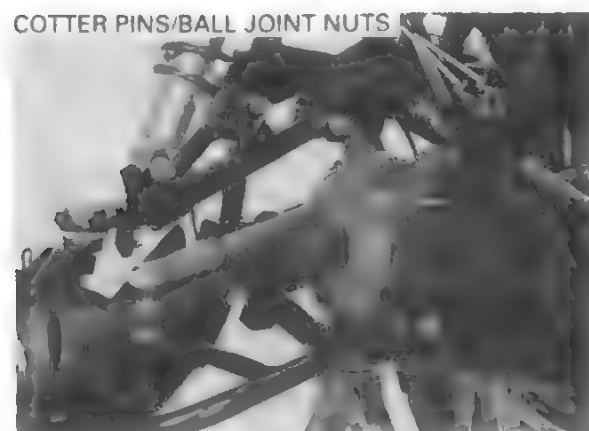


Remove the steering shaft holder bolts and holder.

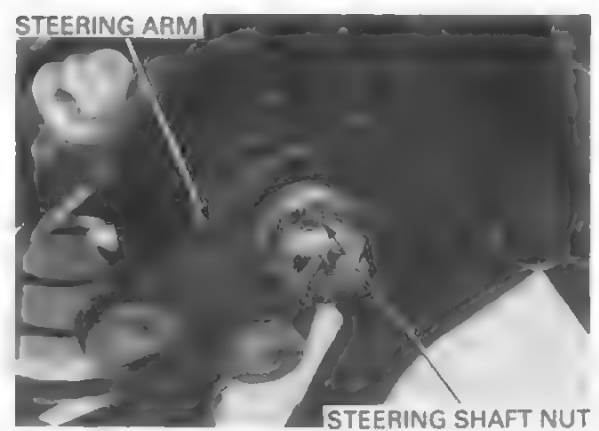


Remove the following:

- Cotter pins
- Tie-rod ball joint nuts
- Tie-rod



Remove the cotter pin and steering shaft U-nut.  
Remove the steering shaft.



### INSPECTION

Remove the steering shaft bushing.

Check the steering shaft bushing for wear or damage.



Check the steering shaft distortion or damage.

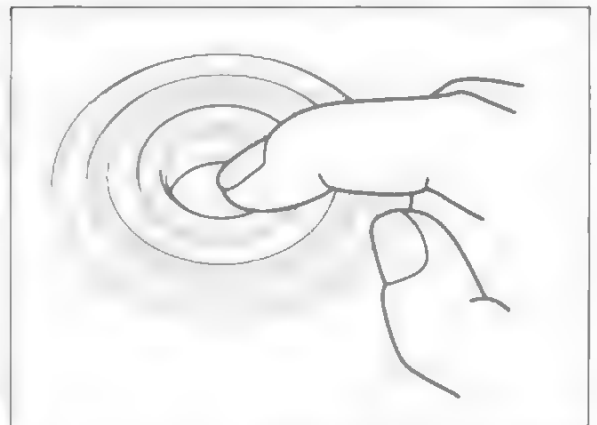


Turn the inner race of steering shaft bearing with your finger.

The bearing should turn smoothly and quietly.

Also check that the bearing outer race fits tightly in the frame.

Remove and discard the bearing if the race does not turn smoothly, quietly or if it fits loosely in the frame.



### BEARING REPLACEMENT

Remove the dust seal.

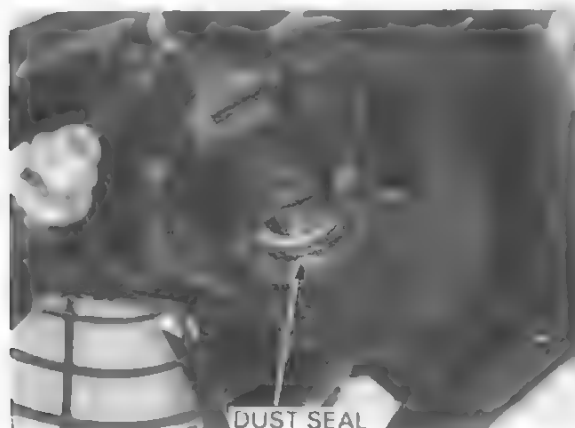


## FRONT WHEEL/SUSPENSION/STEERING

Remove the snap ring.



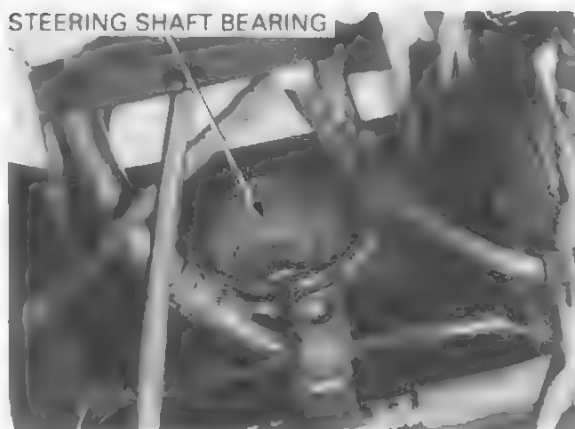
Remove the dust seal.



Remove the steering shaft bearing out from the top of frame using the special tool.

### TOOLS:

Bearing remover set	07936-3710001
- Bearing remover, 20 mm	07936-3710600
- Remover handle	07936-3710100
- Remover weight	07741-0010201 or 07936-3710200



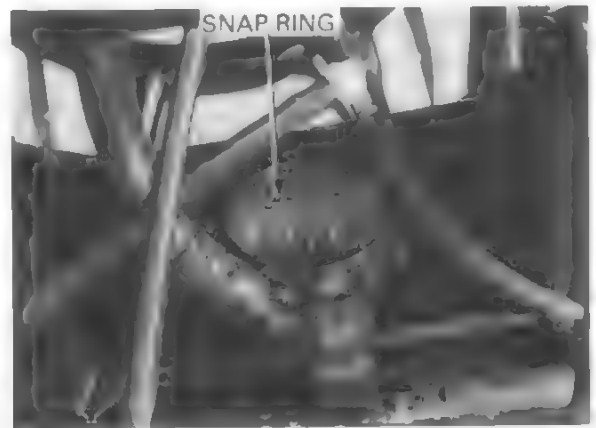
Pack the bearing cavity with grease.  
Install the bearing with its sealed side up using the special tools.

### TOOLS:

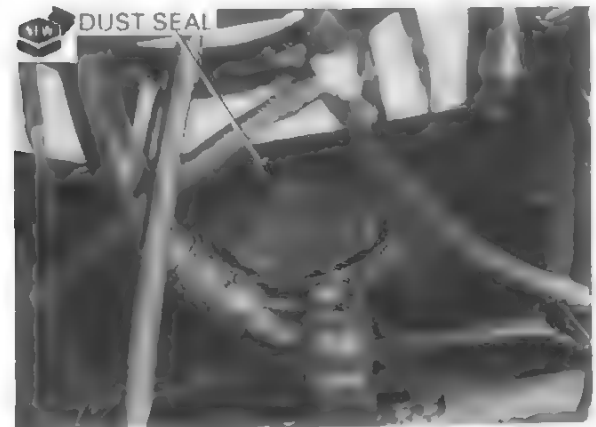
Driver handle	07749-0010000
Attachment, 37 X 40 mm	07746-0010200
Pilot, 20 mm	07746-0040500



Install the snap ring in the groove securely.



Apply grease to new dust seal.  
Install the dust seals.

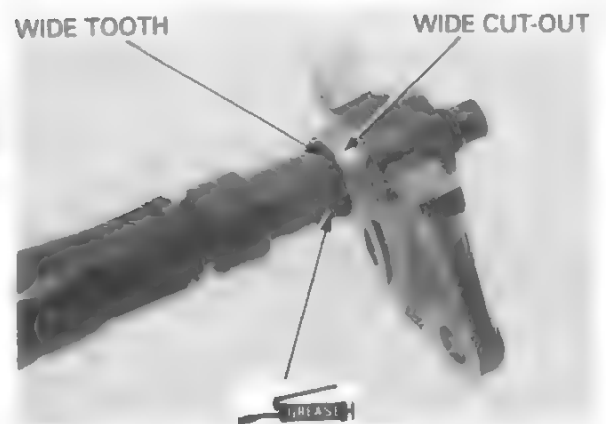


Apply grease to new dust seal.  
Install the dust seal.



## INSTALLATION

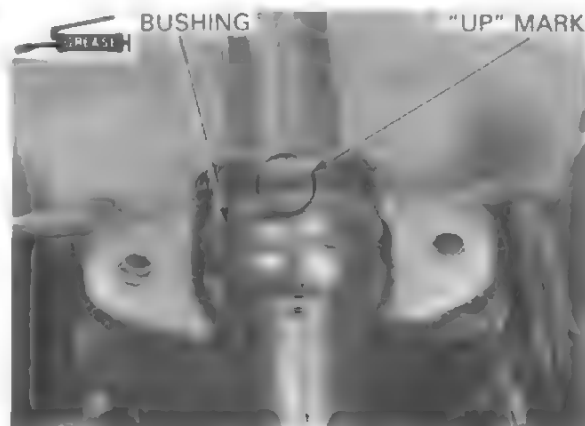
Apply grease to the steering shaft spline.  
Assemble the steering shaft and steering arm by aligning the wide cut-out of the steering arm with the wide tooth of the steering shaft.



## FRONT WHEEL/SUSPENSION/STEERING

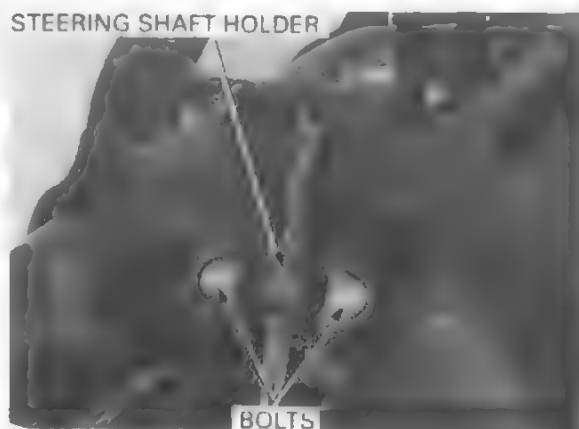
Apply grease to the steering shaft bushing cavities.  
Install the bushing with its "UP" mark facing up.

Install the steering shaft in the frame.



Install the steering shaft holder and tighten the holder bolts to the specified torque.

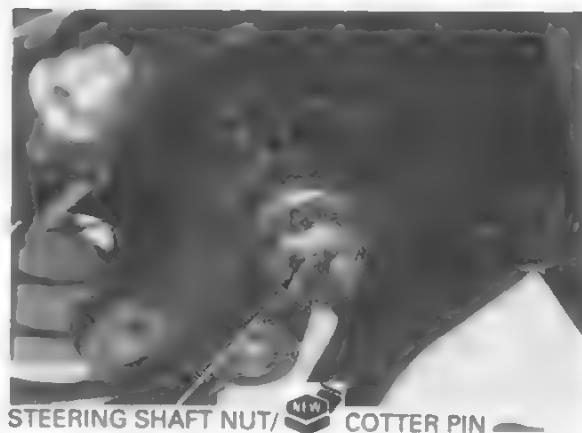
**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**



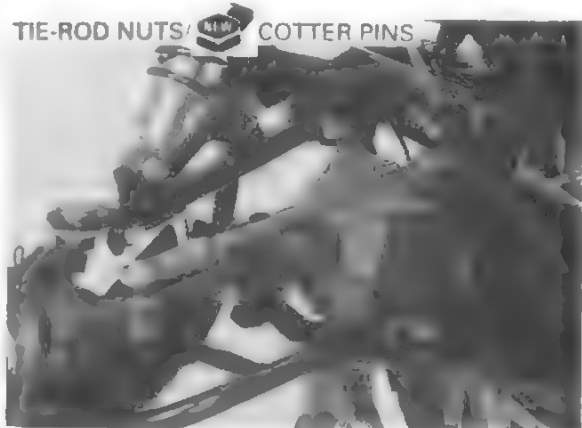
Apply grease to the flange and threads of the steering shaft nut.  
Install the steering shaft and tighten the steering shaft nut to the specified torque.

**TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)**

Install a new cotter pin.



Install the tie-rods on the steering shaft (page 12-18).



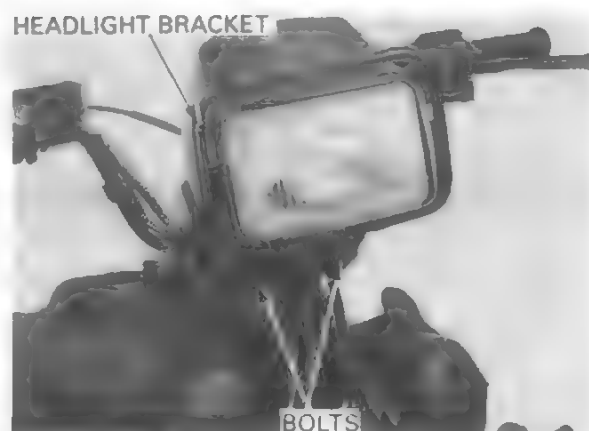
Install the handlebar assembly on the steering shaft and tighten the new lower holder nuts with washers to the specified torque.

**TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)**



Install the headlight bracket and tighten the bolts.

Adjust the toe (page 3-22).



## FRONT SHOCK ABSORBER

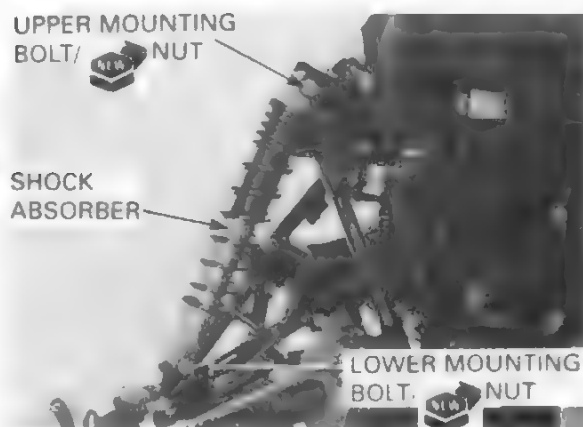
### REMOVAL

Support the vehicle with a support block under the engine to raise the front wheels off the ground.

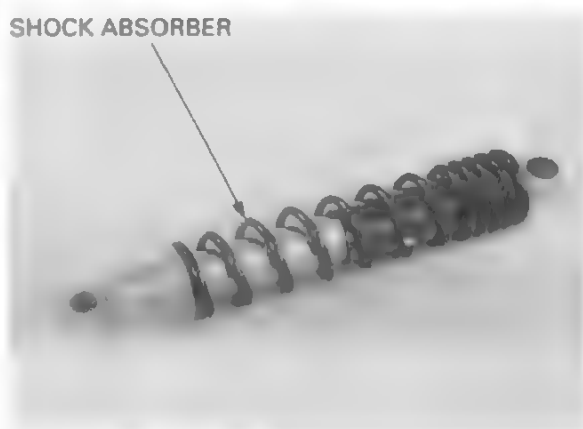
Remove the following:

- Shock absorber mounting bolts/nuts
- Shock absorber

Discard the mounting nuts.



Inspect the damper rod for distortion and signs of oil leakage.  
Inspect the spring and spring guide for damage.





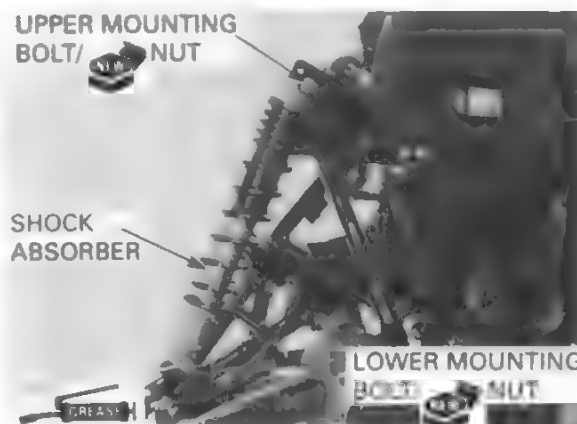
### INSTALLATION

Apply grease to the shock absorber lower pivot collar.

Install the shock absorber and tighten the mounting bolts and new nuts to the specified torque.

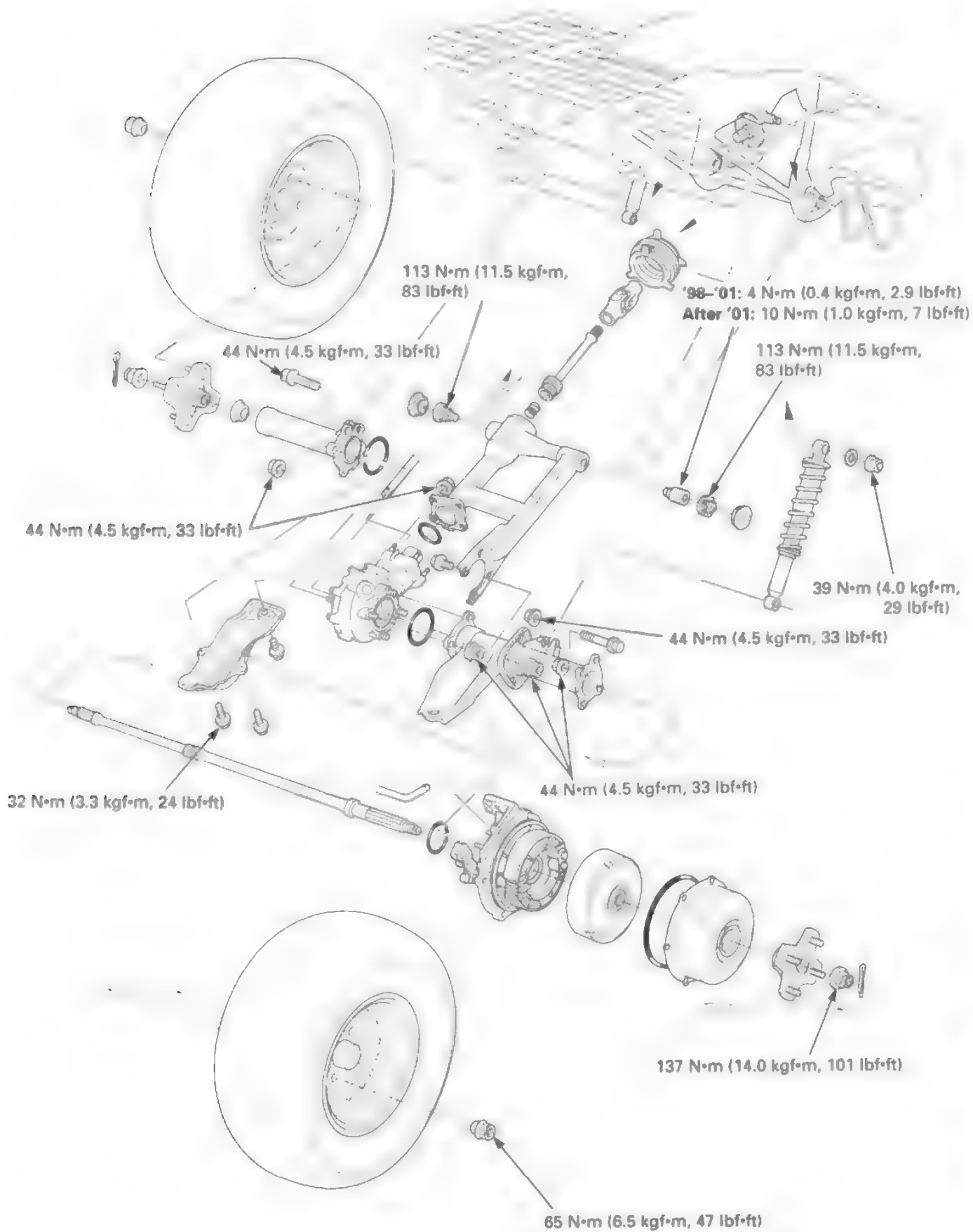
Do not reuse the nuts.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



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MEMO



# 13. REAR WHEEL/SUSPENSION

SERVICE INFORMATION	13-1	REAR SHOCK ABSORBER	13-3
TROUBLESHOOTING	13-2	SWINGARM	<u>13-4</u>
REAR WHEEL	13-3		

## SERVICE INFORMATION

### GENERAL

#### ⚠ WARNING

*A contaminated brake drum or shoe reduces stopping power. Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.*

- A jack or other support is required to support the vehicle.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Minimum tire tread depth		—	4 (0.2)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—

13

### TORQUE VALUES

Rear axle castle nut	137 N•m (14.0 kgf•m, 101 lbf•ft)	
Rear wheel nut	64 N•m (6.5 kgf•m, 47 lbf•ft)	
Rear shock absorber lower mounting bolt/nut	44 N•m (4.5 kgf•m, 33 lbf•ft)	Do not reuse; replace with a new one.
Rear shock absorber upper mounting nut	39 N•m (4.0 kgf•m, 29 lbf•ft)	Do not reuse; replace with a new one.
Damper rod lock nut	37 N•m (3.8 kgf•m, 27 lbf•ft)	Apply a locking agent.
Swingarm left pivot bolt	113 N•m (11.5 kgf•m, 83 lbf•ft)	
Swingarm right pivot bolt ('98 - '01)	4 N•m (0.4 kgf•m, 2.9 lbf•ft)	
(After '01)	10 N•m (1.0 kgf•m, 7 lbf•ft)	
Swingarm right pivot bolt lock nut	113 N•m (11.5 kgf•m, 83 lbf•ft)	
Rear axle housing and swingarm nut	44 N•m (4.5 kgf•m, 33 lbf•ft)	
Skid plate flange bolt	32 N•m (3.3 kgf•m, 24 lbf•ft)	

### TOOLS

Swingarm lock nut wrench	07908-4690003
Remover handle	07936-3710100
Bearing remover, 17 mm	07936-3710300
Remover weight	07741-0010201 or 07936-371020A (U.S.A. only) or 07936-3710200 (U.S.A only)
Driver	07749-0010000
Attachment, 37 X 40 mm	07746-0010200
Pilot, 17 mm	07746-0040400

### TROUBLESHOOTING

#### Wobble or vibration in vehicle

- Bent rim
- Loose brake panel bearing
- Faulty tire
- Axle not tightened properly
- Swingarm bearings worn

#### Soft suspension

- Weak spring

#### Hard suspension

- Bent shock absorber
- Improperly tightened swingarm pivot
- Faulty pivot bearing

#### Suspension noise

- Rear shock absorber damper binding
- Loose fasteners

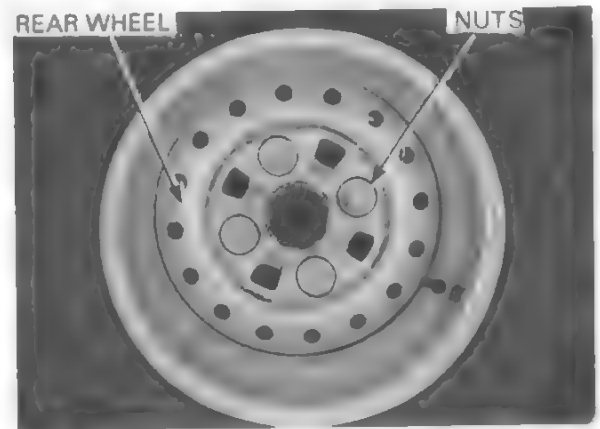
## REAR WHEEL

### REMOVAL

Loosen the wheel nuts.  
Raise the rear wheels off the ground with a jack or block under the engine.

Remove the wheel nuts and wheel.

For tire removal, repair, and installation, refer to page 12-8.



### INSTALLATION

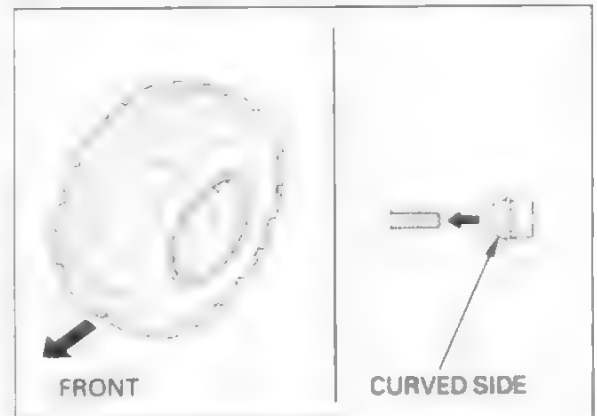
Install the rear wheel with the tire valve facing out so that the tires show a "V" pattern when viewed from front.

#### NOTE:

Do not interchange the right and left tires.

Install the wheel nuts with the curved (tapered) sides facing inward and tighten to the specified torque.

**TORQUE:** 64 N·m (6.5 kgf·m, 47 lbf·ft)



## REAR SHOCK ABSORBER

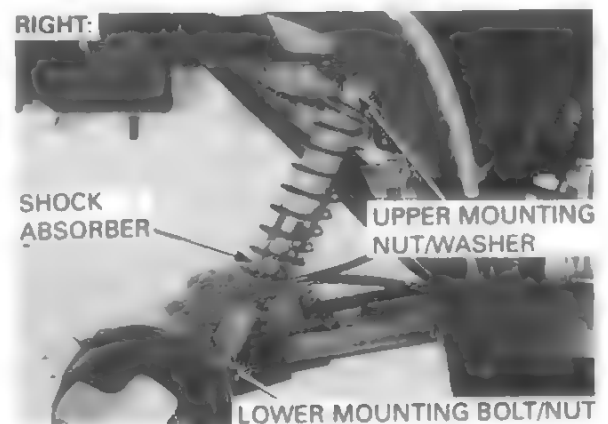
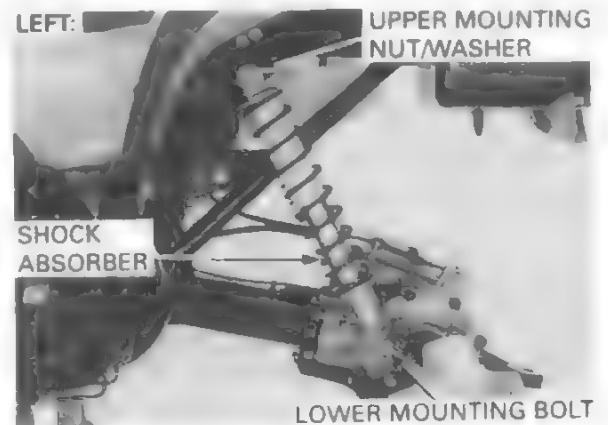
### REMOVAL

Raise the rear wheels off the ground by placing a jack or block under the engine.

Remove the rear shock absorber lower mounting bolt.

Remove the left shock absorber upper mounting nut and washer, then remove the shock absorber. Discard the nuts.

Remove the muffler (page 2-15).  
Remove the right shock absorber lower mounting bolt and nut.  
Remove the right shock absorber upper mounting nut and washer, then remove the shock absorber. Discard the nuts.



### INSTALLATION

Position the rear shock absorber into the frame, and install washer and the new upper mounting nut. Tighten the new upper mounting nut to the specified torque.

Do not reuse the nut.

**TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)**

**Left shock absorber:**

Install and tighten the lower mounting bolt.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

**Right shock absorber:**

Install the lower mounting bolt from the outside. Install and tighten the new lower mounting nut to the specified torque.

Do not reuse the nuts.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the muffler (page 2-17).



## SWINGARM

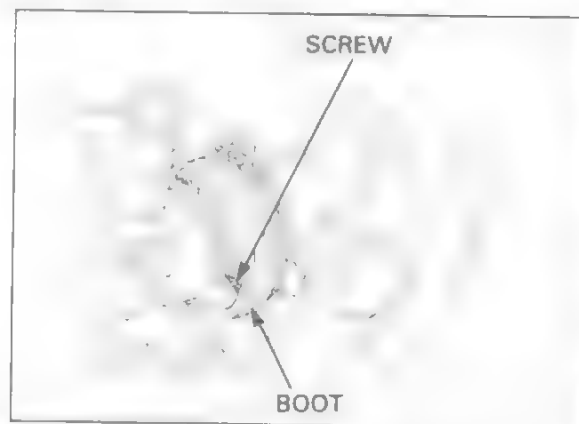
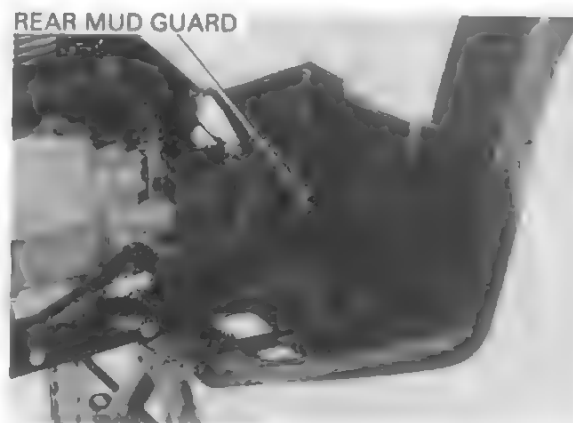
### REMOVAL

Remove the following:

- Rear wheels (page 13-3)
- Rear brake (page 14-15)
- Axle shaft, axle housings and final drive (section 16)

Remove the screws and retaining clips and rear mud guards (page 2-10).

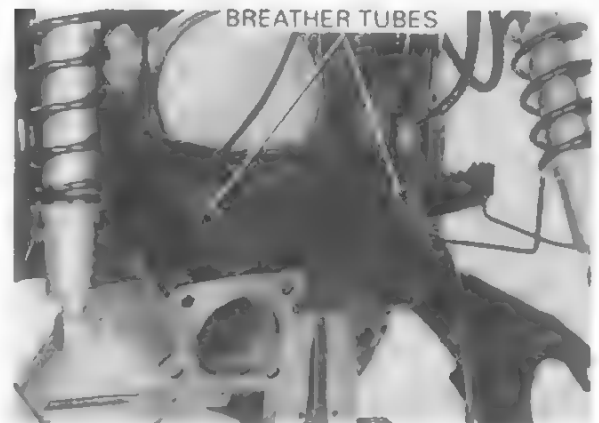
Loosen the swingarm boot band screw.



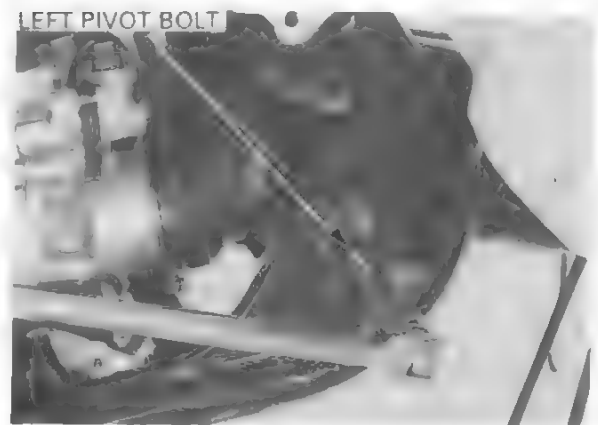
Remove the swingarm pivot cap (each side).



Release the breather tubes from the swingarm clamps.



Remove the left pivot bolt using the commercially available tool as shown.



Remove the right pivot lock nut using the special tool as shown.

**TOOL:**  
Swingarm lock nut wrench 07908-4690003

Remove the right pivot bolt using a commercially available tool.

Remove the swingarm from the frame.

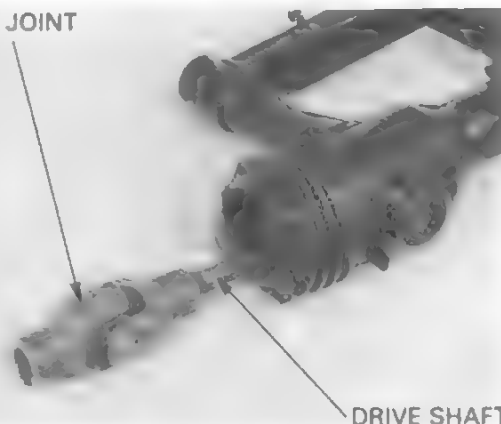




## REAR WHEEL/SUSPENSION

Remove the yoke joint/drive shaft from the swingarm.

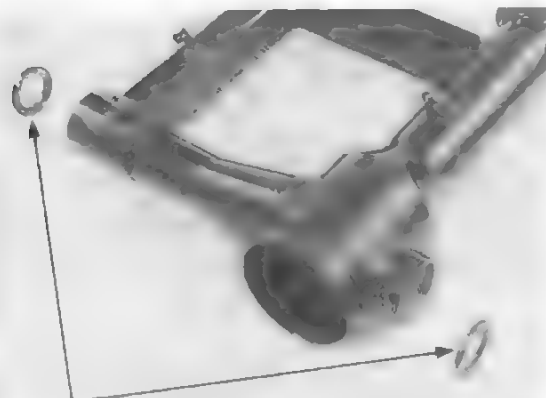
YOKE JOINT



DRIVE SHAFT

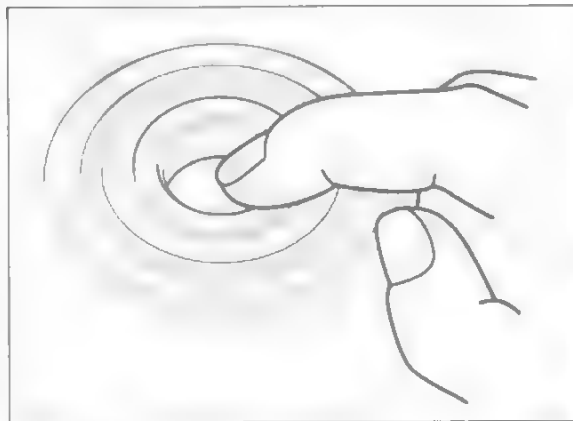
### INSPECTION

- '98 - '01: Remove the dust seals from the swingarm. Check the dust seals for wear or damage.

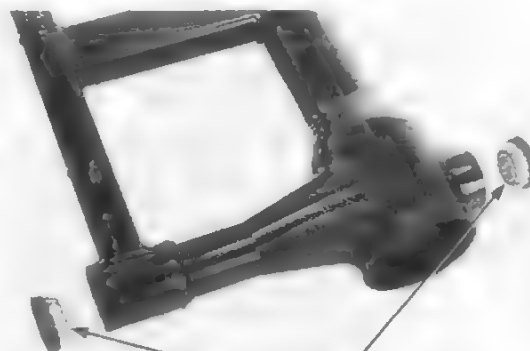


DUST SEALS

- '98 - '01: Turn the inner race of each pivot bearing with your finger. The bearings should turn smoothly and quietly. Also check that the outer race fits tightly in the swingarm pivot. Replace them if necessary (see next page).



- After '01: Remove the pivot bearings from the swingarm. Check the dust seals for wear or damage. Turn the inner race of each pivot bearing with your finger. The bearings should turn smoothly and quietly. Also check that the outer race fits tightly in the swingarm pivot. Replace them if necessary.



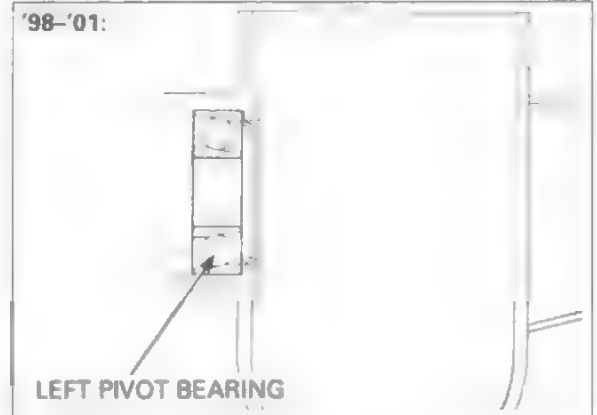
PIVOT BEARINGS

## PIVOT BEARING REPLACEMENT

98 - 01 Remove the swingarm pivot bearing using the special tool.

### TOOLS:

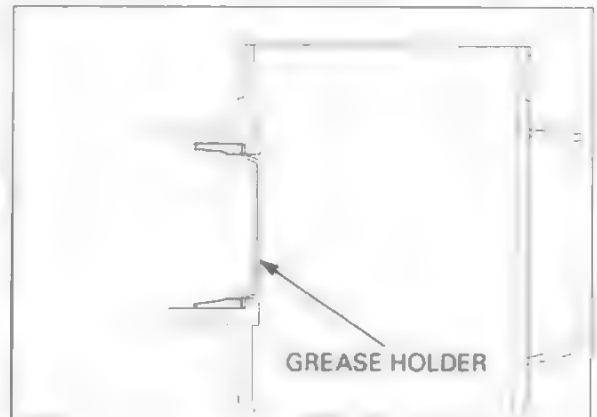
Remover handle	07936-3710100
Bearing remover, 17 mm	07936-3710300
Remover weight	07741-0010201 or 07936-371020A (U.S.A. only) or 07936-3710200 (U.S.A. only)



Drive the grease holder into the swing arm using special tools.

### TOOLS:

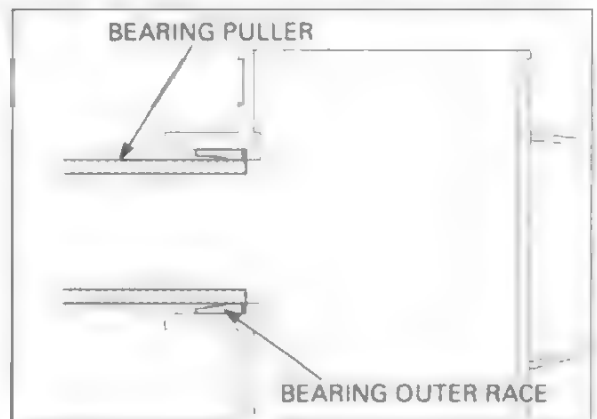
Attachment, 24 X 26 mm	07746-0010700
Driver	07749-0010000



Pull out the pivot bearing outer race using a commercially available 3/8 in X 16 sliding hammer and special tool.

### TOOL:

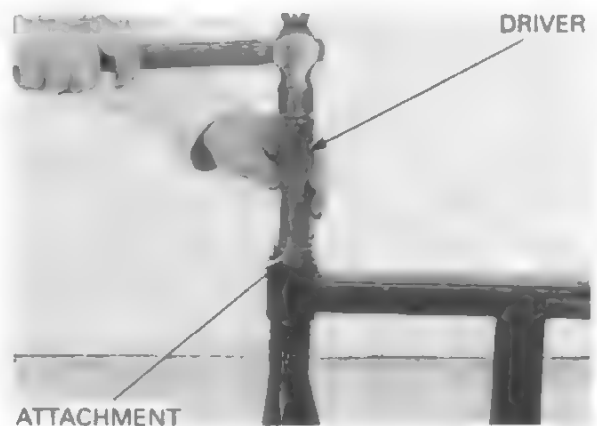
Adjustable bearing puller, 25 - 40 mm	07736-A01000B
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Install the grease holder in the swingarm pivot. Install new pivot bearings (After '01: outer races) using the special tools.

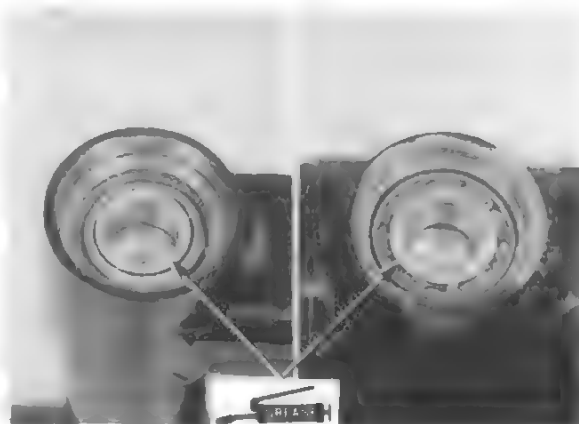
### TOOLS:

Driver	07749-0010000
Attachment, 37 X 40 mm	07746-0010200

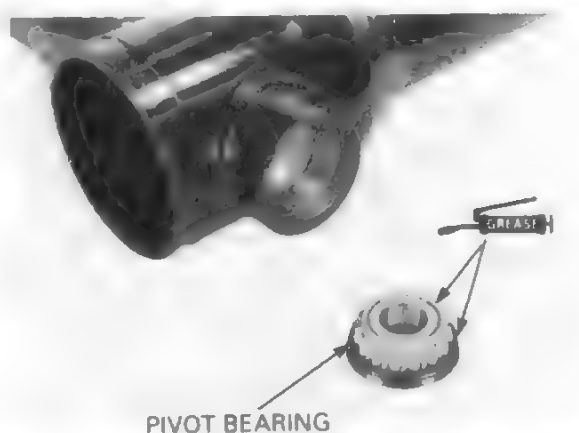


### INSTALLATION

'98 - '01: Pack the grease holders and bearing cavities with grease.



After '01: Apply grease to the pivot bearings and dust seal lips.  
Install the pivot bearings into the swingarm pivots.

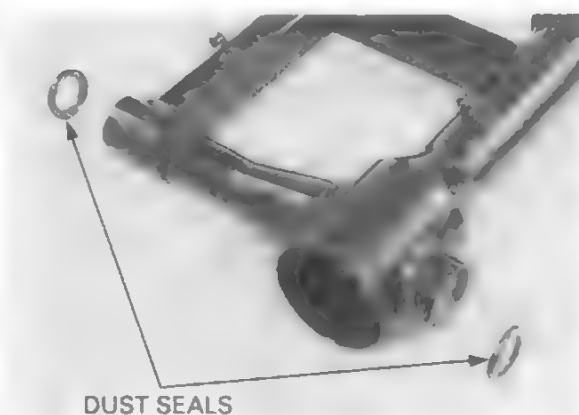


'98 - '01: Apply grease to the dust seal lips, and install the dust seals in the swingarm using the special tools.

#### TOOLS:

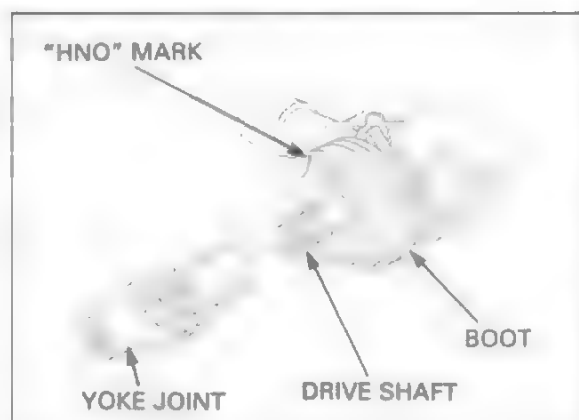
Driver 07749-0010000

Attachment, 37 X 40 mm 07746-0010200

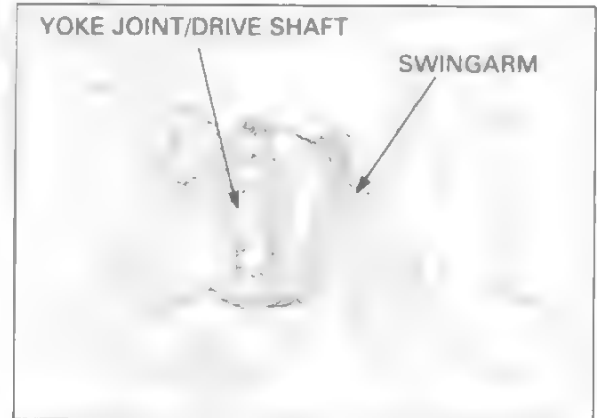


Install the swingarm boot securely with its "HNO" marked tab facing up.

Apply molybdenum disulfide grease to the drive shaft splines and install the yoke joint/drive shaft into the swingarm.



Position the swingarm in the frame by aligning the spline between the final drive shaft and yoke joint.



Install and tighten the left pivot bolt using a commercially available tool as shown.

**TORQUE:** 113 N·m (11.5 kgf·m, 83 lbf·ft)



Install and tighten the right pivot bolt using a commercially available tool.

**TORQUE:** '98 - '01: 4 N·m (0.4 kgf·m, 2.9 lbf·ft)  
After '01: 10 N·m (1.0 kgf·m, 7 lbf·ft)

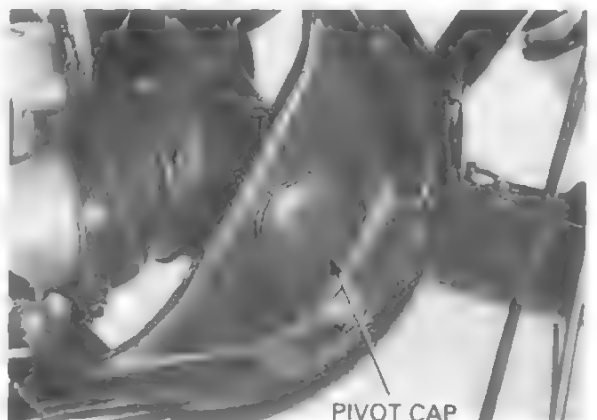
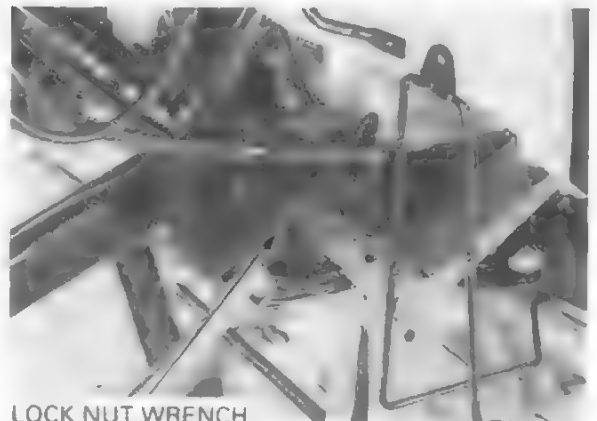
Move the swingarm up and down several times. Retighten the right pivot bolt to the specified torque (see above). Tighten the right pivot lock nut while holding the pivot bolt using the special tools as shown.

**TORQUE:** 113 N·m (11.5 kgf·m, 83 lbf·ft)

**Torque wrench scale reading:**  
103 N·m (10.5 kgf·m, 76 lbf·ft), using a 50 cm (20 in) long torque wrench.

**TOOL:**  
Swingarm lock nut wrench 07908-4690003

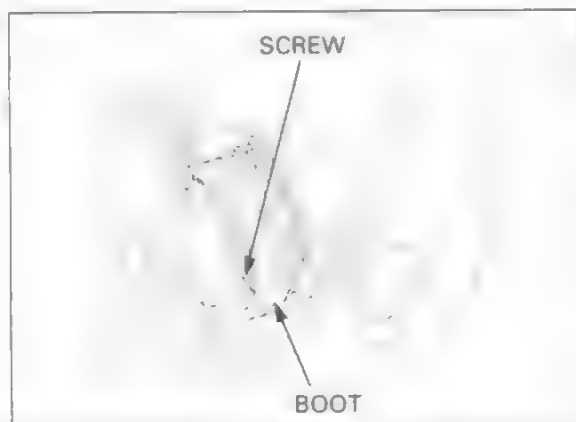
Install the swingarm pivot caps.



## REAR WHEEL/SUSPENSION

---

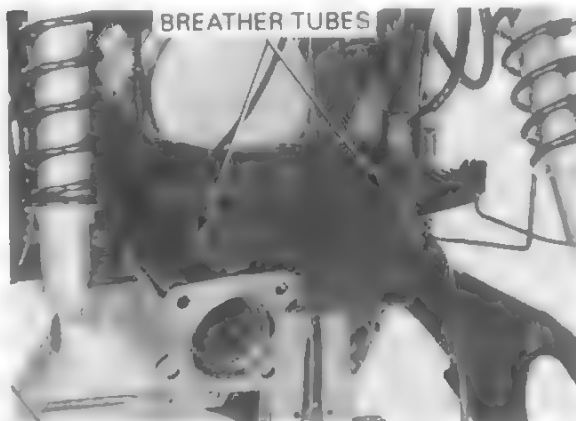
Attach the swingarm boot to the engine and tighten the boot clamp screw securely.



Route the breather tubes and clamp them on the swingarm clamps.

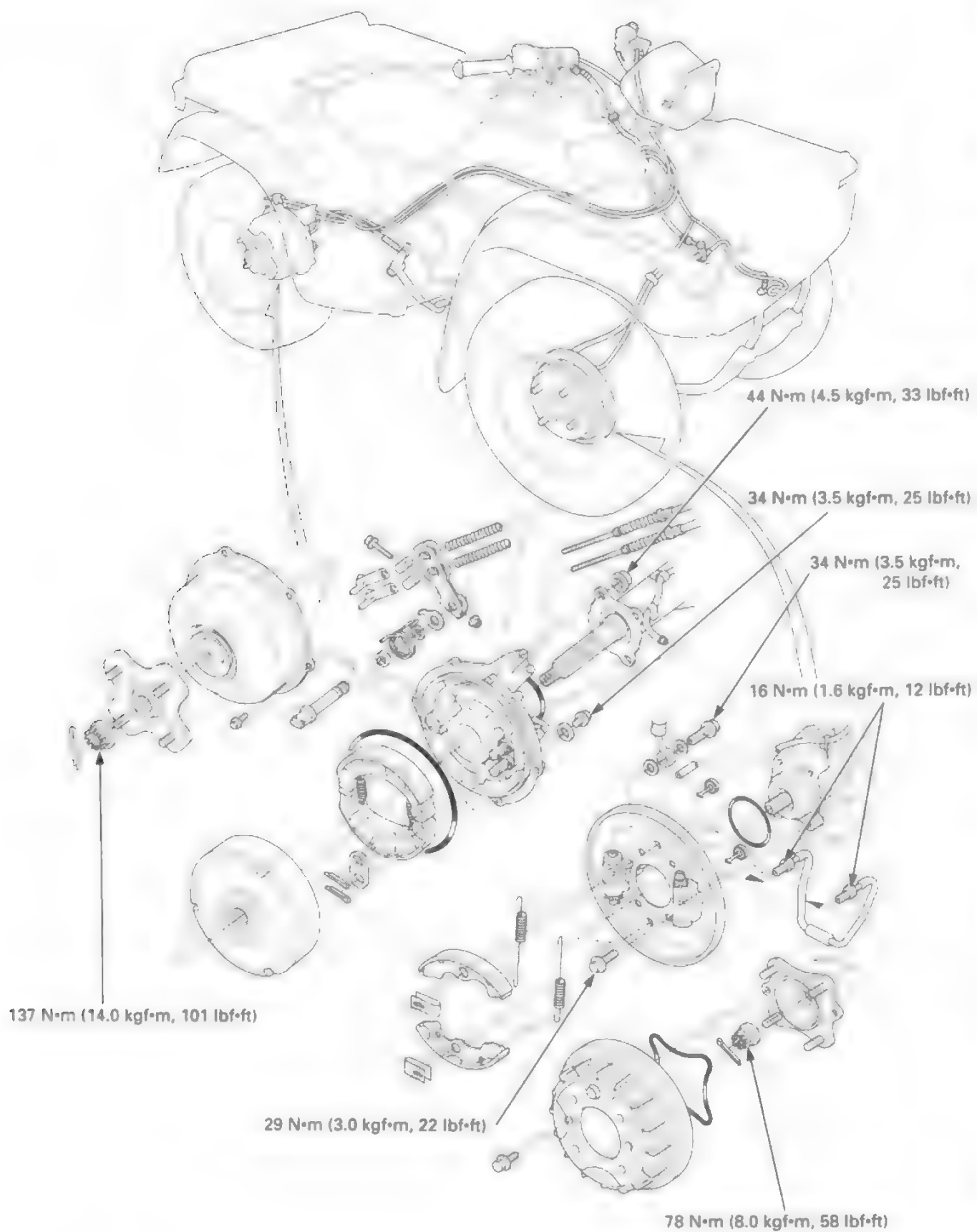
Install the following:

- Final drive, axle housings and axle (page 16-18)
- Rear brake (page 14-19)
- Rear mudguards (page 2-10)
- Rear wheels (page 13-3)



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MEMO



# 14. BRAKE SYSTEM

SERVICE INFORMATION	14-1	BRAKE SHOES/WHEEL CYLINDER/ADJUSTER	14-7
TROUBLESHOOTING	14-2	REAR BRAKE	14-15
BRAKE FLUID REPLACEMENT/AIR BLEEDING	14-3	BRAKE PEDAL	14-23
MASTER CYLINDER	14-5		

## SERVICE INFORMATION

### GENERAL

#### ⚠ WARNING

*A contaminated brake drum or shoe reduces stopping power. Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.*

#### CAUTION:

*Avoid spilling brake fluid on painted, plastic or rubber parts. Place a rag or shop towel over these parts whenever the system is serviced.*

- This section covers maintenance of the front hydraulic brake and rear drum brake systems.
- A jack or other support is required to support the vehicle.
- Once the hydraulic system has been opened, or if the brake feels spongy, the system must be bled.
- Do not allow foreign material to enter the system when filling the reservoir.
- Always use fresh DOT 3 or 4 brake fluid from a sealed container when servicing the system. Do not mix different types of fluid as they may not be compatible.
- Always check the brake operation before riding the vehicle.
- Apply multipurpose grease (NLGI No.3) to the front brake waterproof seal lip.

**14**

## SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Front brake	Drum I.D.	160.0 (6.30)	161.0 (6.34)
	Lining thickness	4.0 (0.16)	2.0 (0.08)
	Brake panel warpage	—	0.4 (0.02)
	Brake panel seal lip wear	—	0.5 (0.02)
	Water seal lip length	22.0 (0.87)	20.0 (0.79)
	Master cylinder I.D.	14.000 – 14.043 (0.5512 – 0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957 – 13.984 (0.5495 – 0.5506)	13.954 (0.5490)
	Wheel cylinder I.D.	19.050 – 19.012 (0.7500 – 0.7520)	19.12 (0.753)
	Wheel cylinder piston O.D.	18.997 – 19.030 (0.7479 – 0.7492)	18.81 (0.741)
Rear brake	Drum I.D.	160.0 (6.30)	161.0 (36.34)
	Lining thickness	5.0 (0.20)	To the indicator



## BRAKE SYSTEM

### TORQUE VALUES

Rear brake arm pinch bolt/nut	20 N•m (2.0 kgf•m, 14 lbf•ft)	
Rear brake drain bolt ('98 - '01):	34 N•m (3.5 kgf•m, 25 lbf•ft)	
(After '01):	12 N•m (1.2 kgf•m, 9 lbf•ft)	
Master cylinder reservoir cap screw	2 N•m (0.2 kgf•m, 1.4 lbf•ft)	
Master cylinder holder SH bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)	
Brake hose oil bolt	34 N•m (3.5 kgf•m, 25 lbf•ft)	
Brake panel flange bolt	29 N•m (3.0 kgf•m, 22 lbf•ft)	Do not reuse; replace with a new one.
Brake hose clamp flange bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)	
Brake lever pivot bolt	1 N•m (0.1 kgf•m, 0.7 lbf•ft)	
Brake lever pivot lock nut	6 N•m (0.6 kgf•m, 4.3 lbf•ft)	
Brake bleeder valve	6 N•m (0.6 kgf•m, 4.3 lbf•ft)	
Brake wheel cylinder nut	17 N•m (1.7 kgf•m, 12 lbf•ft)	
Brake adjuster bolt/washer	8 N•m (0.8 kgf•m, 5.8 lbf•ft)	
Front wheel hub castle nut	78 N•m (8.0 kgf•m, 58 lbf•ft)	Castle nut
Rear wheel hub nut	137 N•m (14.0 kgf•m, 101 lbf•ft)	Castle nut
Wheel cylinder oil pipe	16 N•m (1.6 kgf•m, 12 lbf•ft)	
Brake breather hose clamp	32 N•m (3.3 kgf•m, 24 lbf•ft)	
Brake hose 2-way joint	15 N•m (1.5 kgf•m, 11 lbf•ft)	

### TOOLS

Snap ring pliers	07914-3230001
Driver	07749-0010000
Oil seal driver	07965-MC70100
Attachment, 52 X 55 mm	07746-0010400
Pilot, 28 mm	07746-0041100
Attachment, 62 X 68 mm	07746-0010500

### TROUBLESHOOTING

#### Front wheel wobbling and noise

- Worn brake shoe
- Loose wheel bearing

#### Poor brake performance

- Brake not adjusted properly
- Worn brake shoes
- Brake fluid leak
- Water in the front brake drum
- Incorrectly installed rear brake arm
- Contaminated brake shoe
- Worn rear brake cam
- Worn rear brake drum

## BRAKE FLUID REPLACEMENT/AIR BLEEDING

### BRAKE FLUID DRAINING

#### CAUTION:

- *Do not allow foreign material to enter the system when filling the reservoir.*
- *Avoid spilling fluid on painted, plastic, or rubber parts. Place a rag over these parts whenever the system is serviced.*

With the fluid reservoir parallel to the ground, remove the reservoir cover and diaphragm.

Connect a bleed hose to the bleed valve. Loosen the bleed valve and pump the brake lever. Stop pumping the lever when no more fluid flows out of the bleed valve.

### BRAKE FLUID FILLING

Fill the reservoir with DOT 3 or 4 brake fluid from a sealed container.

#### CAUTION:

*Do not mix different types of fluid. They are not compatible.*

Connect a commercially available brake bleeder to the bleed valve.

Pump the brake bleeder and loosen the bleed valve, adding fluid when the fluid level in the master cylinder reservoir is low.

#### NOTE:

- Check the fluid level often while bleeding the brakes to prevent air from being pumped into the system.
- When using a brake bleeding tool, follow the manufacturer's operating instructions.

Repeat the above procedure until air bubbles do not appear in the plastic hose.

#### NOTE:

- If air is entering the bleeder from around the bleed valve threads, seal the threads with Teflon tape.
- If a brake bleeder is not available, fill the master cylinder and operate the brake lever to fill the system.

Close the bleed valve. Next, perform the BLEEDING procedure (page 14-4).



### BRAKE BLEEDING

Connect a clear bleed hose to the bleed valve. Pump up the system pressure with the lever until there are no air bubbles in the fluid flowing out of the master cylinder and lever resistance is felt.

1. Squeeze the brake lever, open the bleed valve 1/2 turn and then close the valve.

#### NOTE:

Do not release the brake lever until the bleed valve has been closed.

2. Release the brake lever when the bleed valve has been closed.

Repeat steps 1 and 2 until bubbles cease to appear in the fluid coming out of the bleed valve.

Fill the fluid reservoir to the upper level.

Reinstall the diaphragm and reservoir cover, and tighten the screws.

**TORQUE: 2 N-m (0.2 kgf-m, 1.4 lbf-ft)**

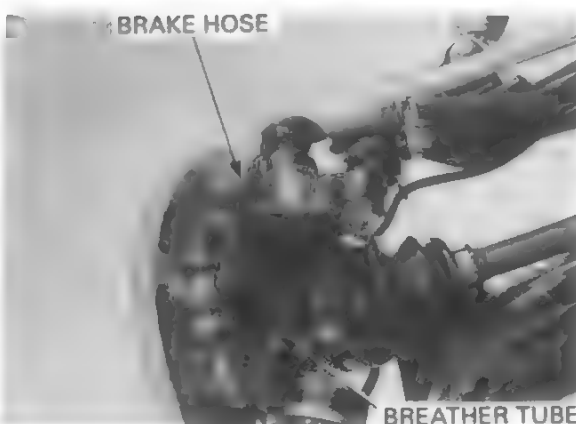
### BRAKE HOSE/BRAKE PIPE INSPECTION

Remove the front fender (page 2-6).

Check the brake hose and brake pipe for damage and brake fluid leaks.

Check the front brake breather tubes for secure connections and damage.

A disconnected breather tube means that the front brake drum can fill with water.



## MASTER CYLINDER

### DISASSEMBLY

Remove the reservoir cover, diaphragm and float, and soak up the brake fluid from the reservoir. Disconnect the brake hose from the master cylinder by removing the bolt/two sealing washers. Fix the brake hose to prevent the fluid from flowing out.

#### CAUTION:

*Avoid spilling fluid on painted, plastic, or rubber parts. Place a rag over these parts whenever the system is serviced.*

Remove the front brake lever nut, pivot bolt and lever.

Remove the bolts from the master cylinder holder and remove the master cylinder.

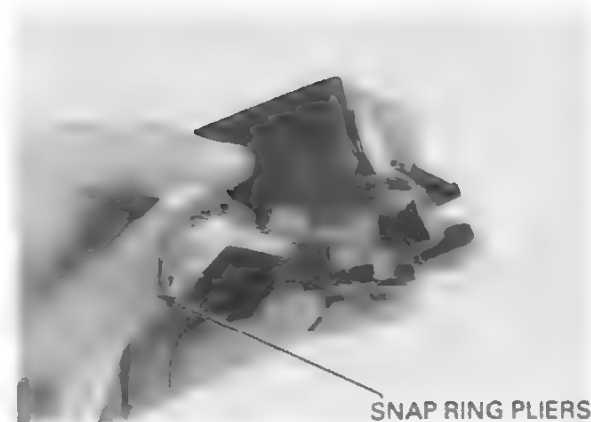
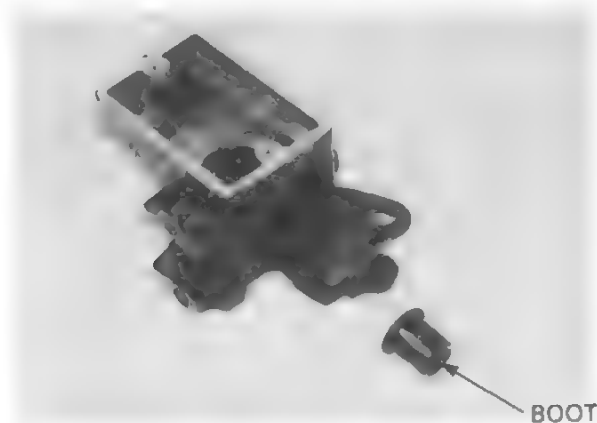
Remove the boot.

Depress the piston and remove the snap ring from the master cylinder body, using the special tool as shown.

#### TOOL:

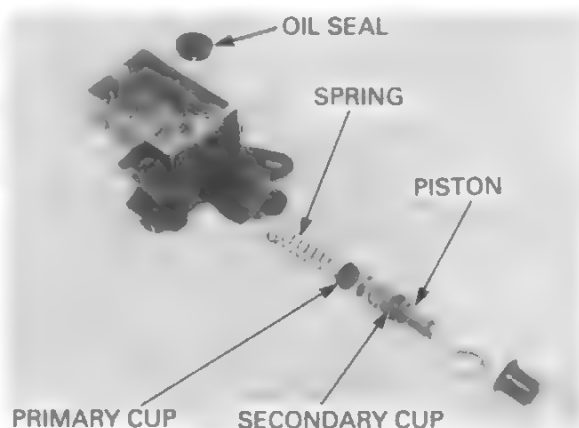
Snap ring pliers

07914-3230001



## BRAKE SYSTEM

Remove the oil seal, piston and spring.  
Clean the inside of the cylinder and reservoir with brake fluid.  
Check the oil seal, piston boot, primary cup and secondary cup for fatigue or damage.  
Check the master cylinder and piston for abnormal scratches.



### INSPECTION

Measure the master cylinder I.D.

**SERVICE LIMIT: 14.055 mm (0.5533 in)**

Measure the master cylinder piston O.D.

**SERVICE LIMIT: 13.945 mm (0.5490 in)**



### ASSEMBLY

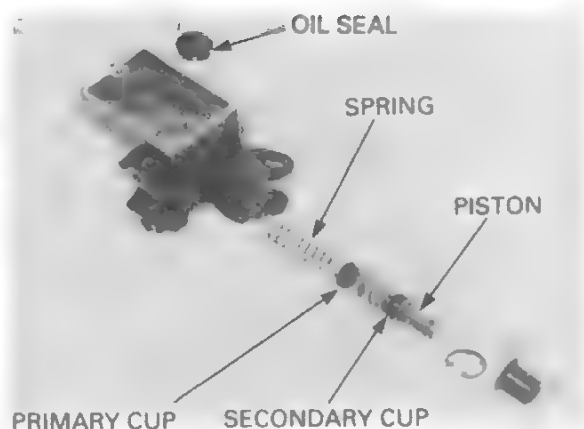
#### CAUTION:

*Keep the piston, cups, spring, snap ring and boot as a set; do not substitute individual parts.*

Coat all parts with clean brake fluid before assembly.

Install the spring to the piston.

Install the oil seal and piston assembly.



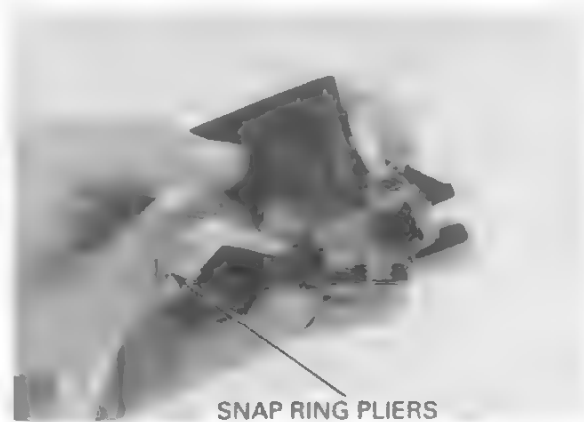
#### CAUTION:

*When installing the cups, do not allow the lips to turn inside out.*

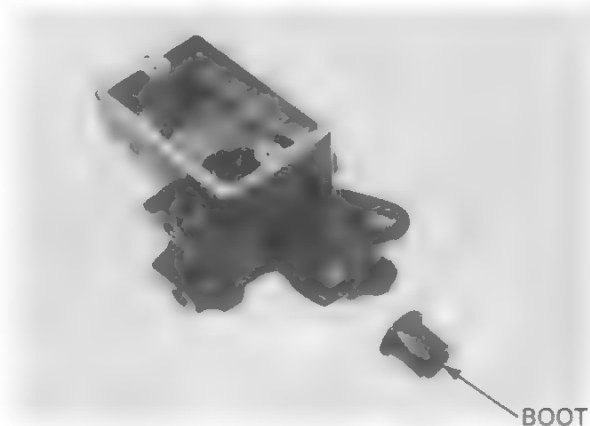
Install the snap ring.

#### CAUTION:

*Be certain the snap ring is firmly seated in the groove.*



Install the boot.



Place the master cylinder on the handlebar.

Install the master cylinder holder with the "UP" mark facing up.

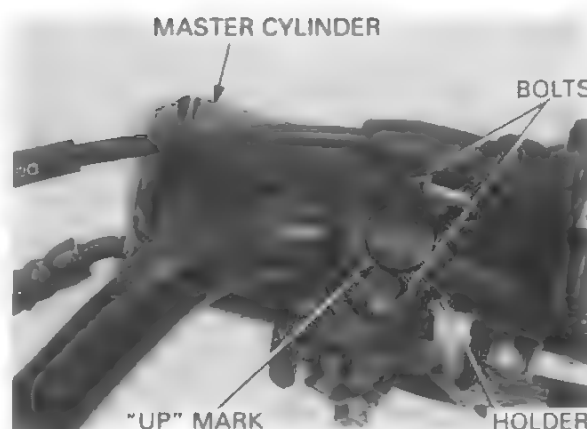
Tighten the upper bolt first, then tighten the lower bolt loosely.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Align the end of the master cylinder with the punch mark on the handlebar.

Tighten the lower bolt.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**



Install the brake hose between the stoppers with the bolt and new sealing washers.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

Install the brake lever.

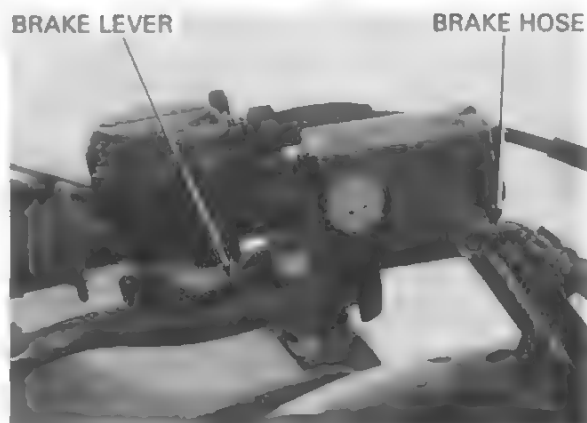
Install and tighten the pivot bolt.

**TORQUE: 1 N·m (0.1 kgf·m, 0.7 lbf·ft)**

Hold the pivot bolt and tighten the nut.

**TORQUE: 6 N·m (0.6 kgf·m, 4.3 lbf·ft)**

Fill the reservoir to the upper level and bleed the brake system (page 14-3).

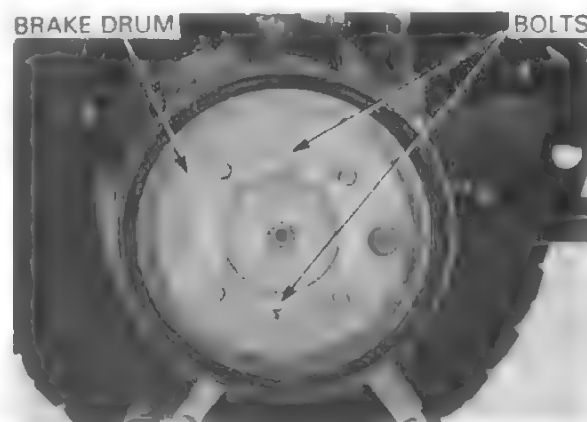


## BRAKE SHOES/WHEEL CYLINDER/ADJUSTER

### DISASSEMBLY

Remove the following:

- Front wheel (page 12-8)
- Bolts
- Brake drum



## BRAKE SYSTEM

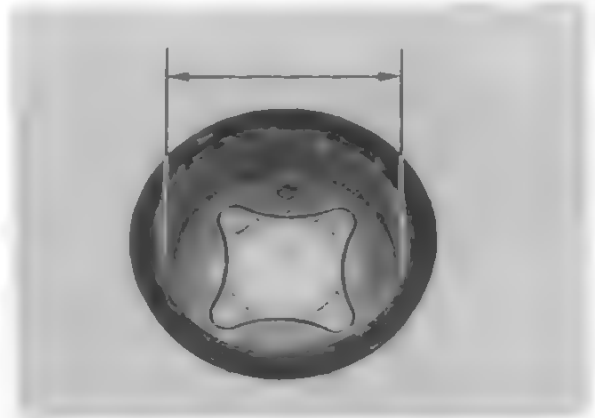
Measure the brake drum I.D.

**SERVICE LIMIT: 161 mm (6.34 in)**

Remove the following:

- Wheel hub and O-ring
- Dust seal

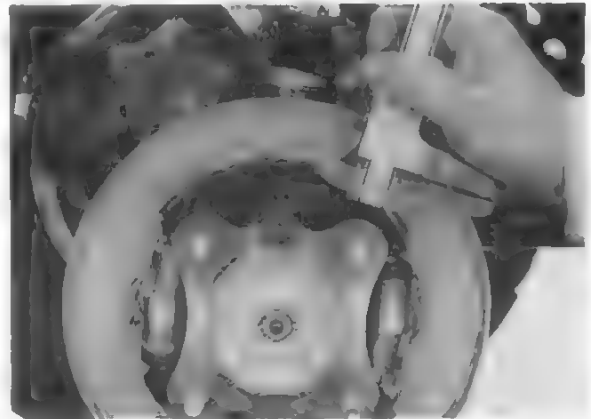
For front brake waterproof seal inspection/replacement, see page 14-11.



Measure the brake lining thickness.

**SERVICE LIMIT: 2.0 mm (0.08 in)**

For brake panel inspection, see page 14-10.

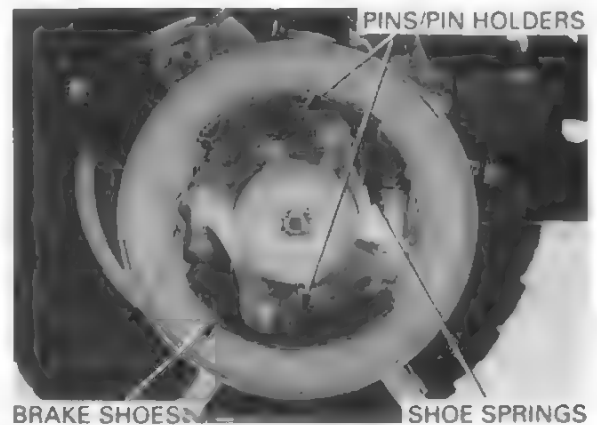


For brake panel inspection, see page 14-10.

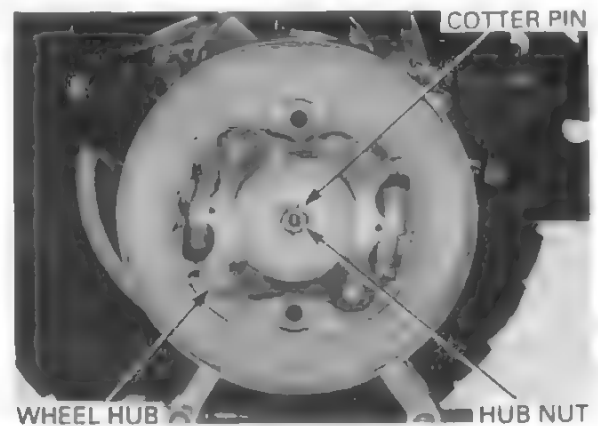
Remove the following:

- Pins
- Pin holders
- Brake shoes and shoe springs

*Mark the brake shoes to indicate their original positions.*



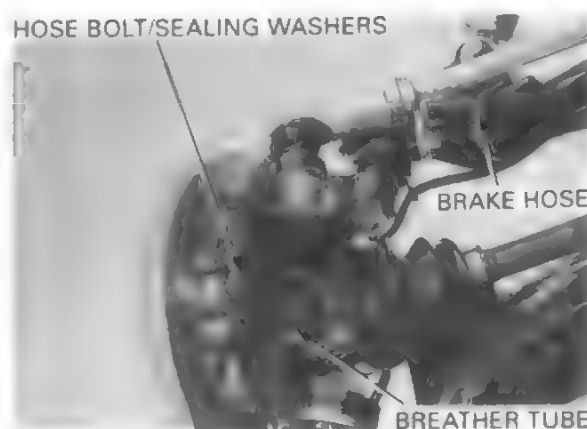
Remove the cotter pin and hub nut.  
Remove the wheel hub.



Drain the brake fluid (page 14-3).

Remove the following:

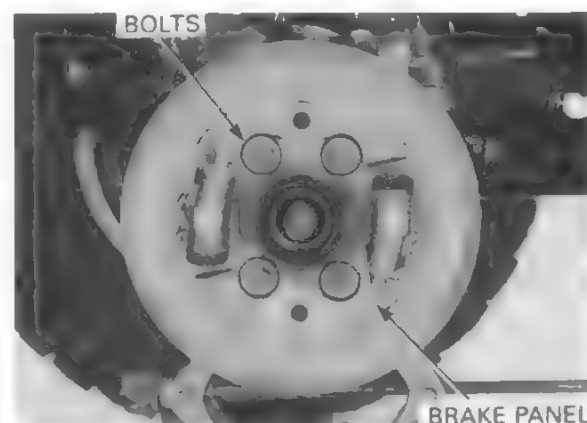
- Brake hose by removing the brake hose bolt
- Breather tube from brake panel



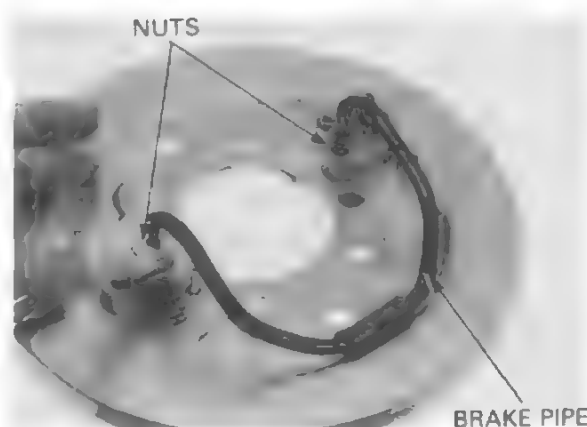
- Brake panel bolts and brake panel
- O-ring

## CAUTION:

*Discard the panel bolts. Do not reuse the panel bolts because their threads are specially dry-coated for waterproofing.*

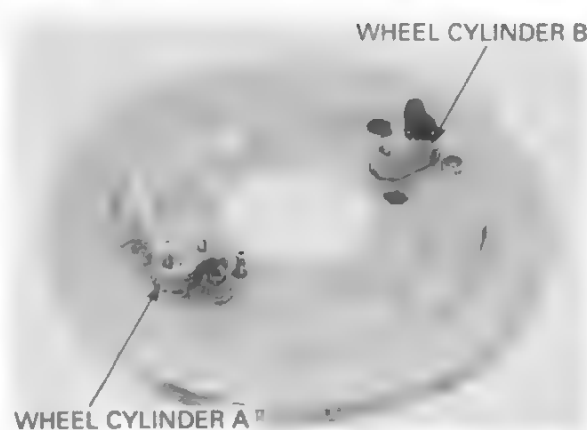


Loosen the joint nuts and remove the brake pipe.



Remove the wheel cylinder assembly A and B by removing the bolts and nuts.

Clean any sealant material from the cylinders, bolts and brake panel.





### WHEEL CYLINDER/ADJUSTER INSPECTION

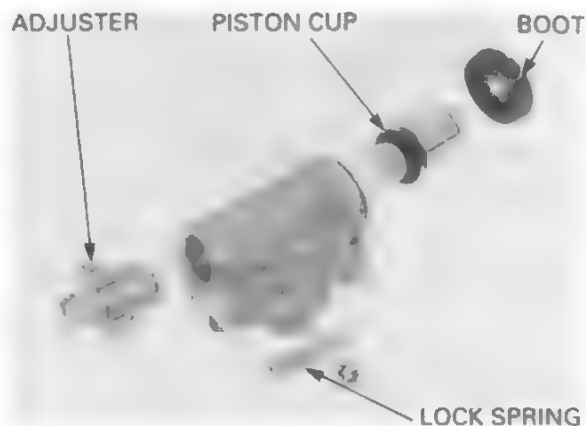
Disassemble the wheel cylinder assembly A and B.

Inspect the wheel cylinder bore and piston for scoring or grooving.

Inspect the piston cup and piston boot for wear or fatigue.

Inspect the adjuster body and adjuster nut for wear or damage.

Check the lock spring for fatigue or damage.



Measure the wheel cylinder I.D.

**SERVICE LIMIT: 19.12 mm (0.753 in)**

Measure the wheel cylinder piston O.D.

**SERVICE LIMIT: 18.81 mm (0.741 in)**



### FRONT BRAKE PANEL INSPECTION

Remove the wheel hub from the brake drum and temporarily install the hub on the axle shaft.

Tighten the axle nut securely.

Install a suitable steel plate to the wheel hub and tighten the plate with the wheel nut securely.

Clean any grease from the brake panel.

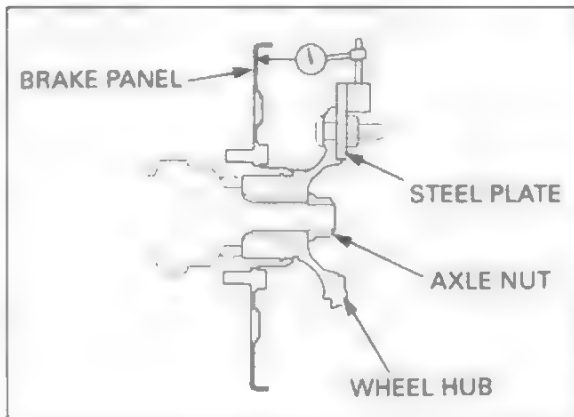
#### **⚠ WARNING**

***Grease on the brake linings reduces stopping power. Keep grease off the linings.***

Measure the brake panel on the points attached to the waterproof seal lip for warpage as shown, using a dial indicator.

**SERVICE LIMIT: 0.4 mm (0.02 in)**

Replace the brake panel if warpage is greater than the service limit.

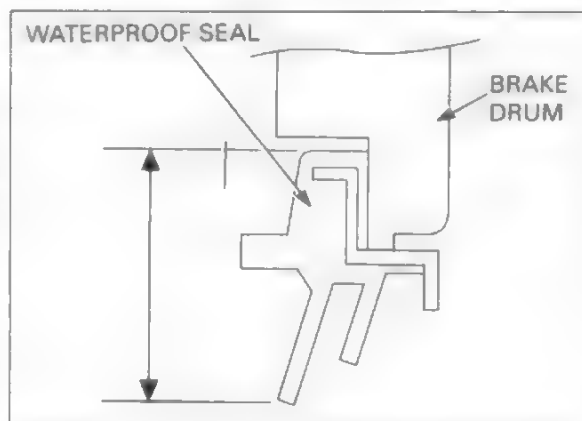


## FRONT BRAKE WATERPROOF SEAL INSPECTION

Check the waterproof seal for damage, fatigue or faulty installation.

Measure the front brake waterproof seal lip length.

**SERVICE LIMIT:** 20 mm (0.79 in)



## FRONT BRAKE WATERPROOF SEAL REPLACEMENT

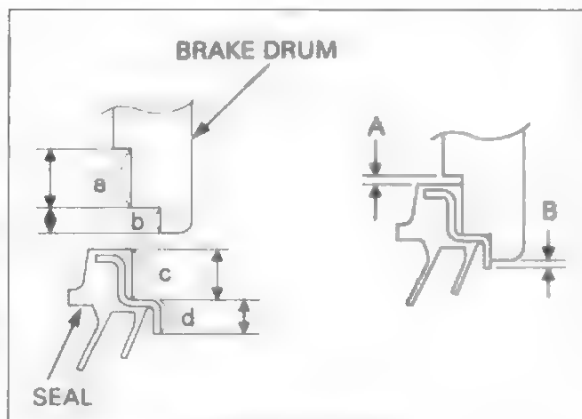
Remove the waterproof seal from the brake drum by prying open the seal edge.

Remove the wheel hub.

### CALCULATE THE CLEARANCES BETWEEN THE DRUM AND SEAL

Measure the drum and seal at a, b, c and d as shown. Calculate the clearances A and B between the drum and seal.

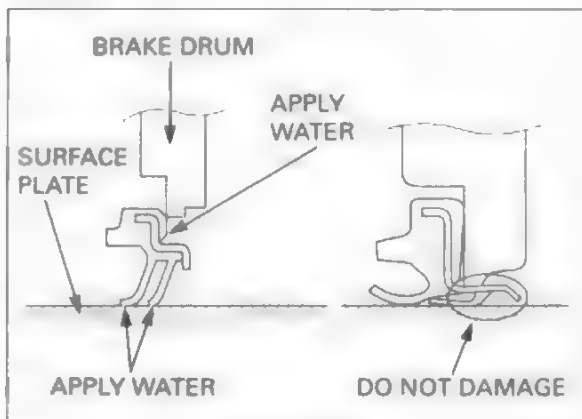
$$A = a - c \quad B = d - b$$



Apply water to the entire new waterproof seal. Place the waterproof seal on a clean surface plate, and press the brake drum into the waterproof seal, making sure that the clearances between the seal and drum will reach the calculated clearance (see previous step).

### CAUTION:

- Press the drum onto the seal evenly, so the lips will not be damaged. If the seal is damaged or mis-installed, remove it and try again with a new seal.
- Place a steel plate (about 140 mm (5.5 in) in diameter and more than 10 mm (0.4 in) in thickness) on the brake drum, or the brake drum will be warped or damaged.

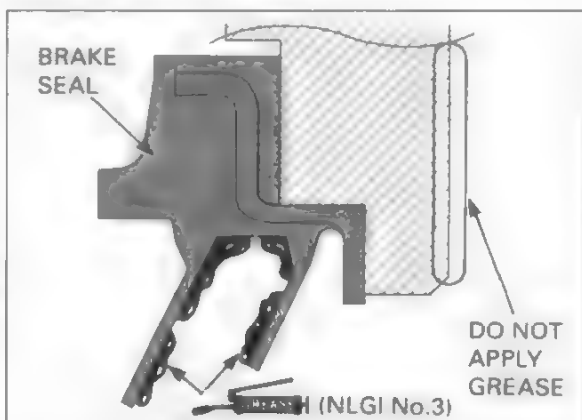


Dry the seal thoroughly and pack the lips cavity with multipurpose grease (NLGI No.3) as shown.

**AMOUNT OF GREASE:** 14 – 16 g (0.5 – 0.6 oz)

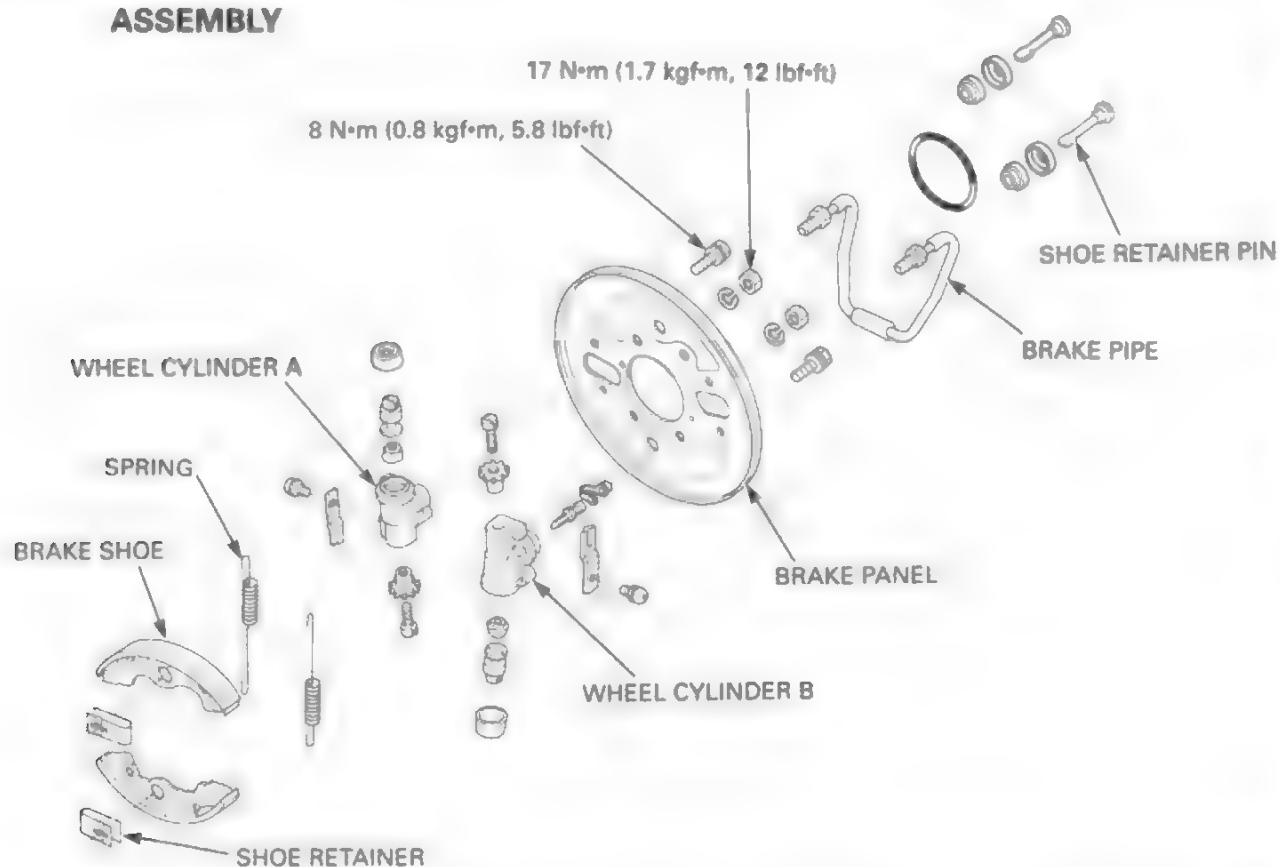
### WARNING

Do not apply grease to the inner surface of the brake drum. Grease on the inner surface of drum reduces stopping power. Keep grease off the drum.



## BRAKE SYSTEM

### ASSEMBLY



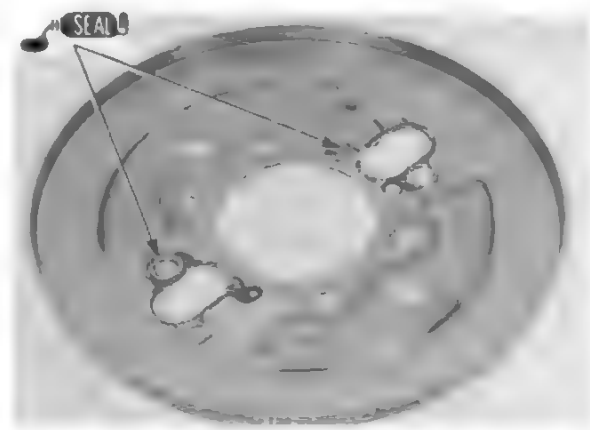
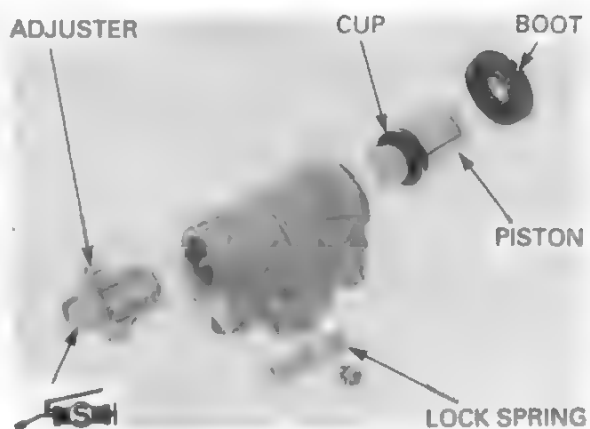
Clean all parts, excluding the boots, thoroughly with BRAKE FLUID only.  
Blow out passages with compressed air.

Install the pistons into the wheel cylinder body without allowing the lips to turn inside out.

Install the boots on the cylinder body.

Apply silicone grease to the adjuster nut.  
Install the adjuster nut, screw and lock spring on the adjuster body.

Apply sealant to the cylinder's mounting locations on the brake panel.

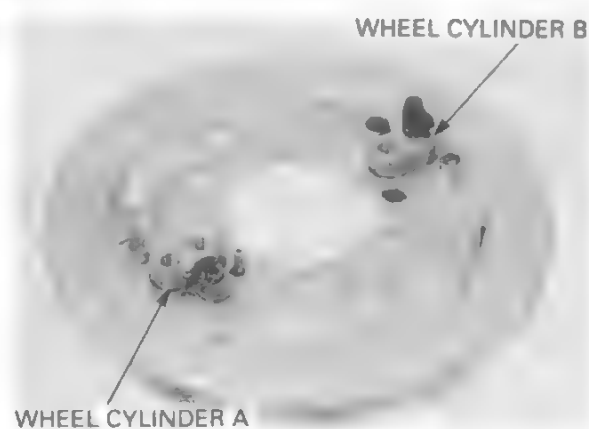


Install the cylinder assembly A and B, and tighten the bolts, washers and nuts.

## TORQUE:

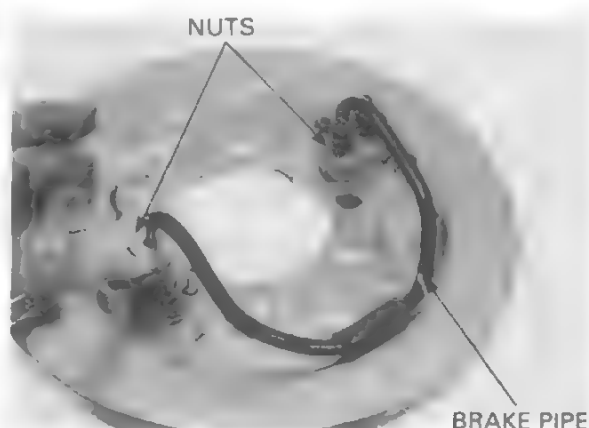
6 mm bolt: 8 N·m (0.8 kgf·m, 6 lbf·ft)

8 mm nut: 17 N·m (1.7 kgf·m, 12 lbf·ft)

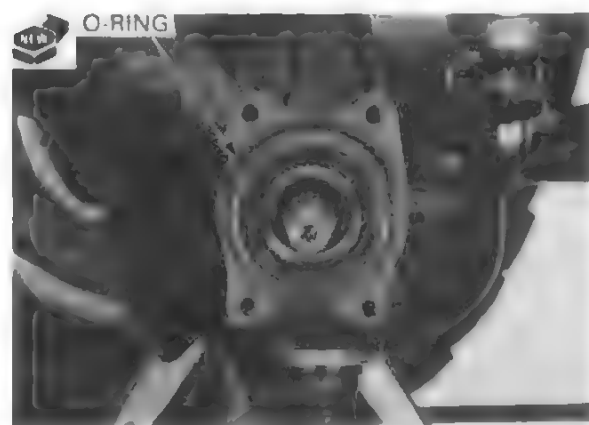


Install the brake pipe as shown by tightening the joint nuts.

**TORQUE:** 16 N·m (1.6 kgf·m, 12 lbf·ft)



Install a new O-ring on the knuckle.



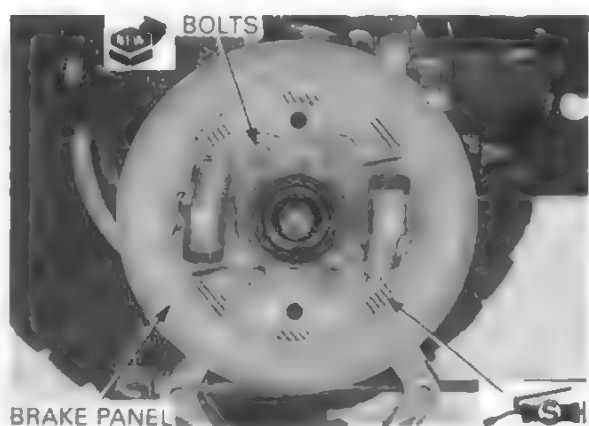
Install the front brake panel assembly and tighten the new brake panel bolts.

**TORQUE:** 29 N·m (3.0 kgf·m, 22 lbf·ft)

## CAUTION:

*Discard the used panel bolts. Do not reuse the panel bolts because their threads are specially dry-coated for waterproofing.*

Apply silicone grease on the metal contact area indicated.



## BRAKE SYSTEM

Install the brake hose to the cylinder assembly A and tighten the brake hose bolt with new sealing washers.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

Securely install the breather tube to cylinder assembly A.

**NOTE:**

Route the brake hose between the stoppers.

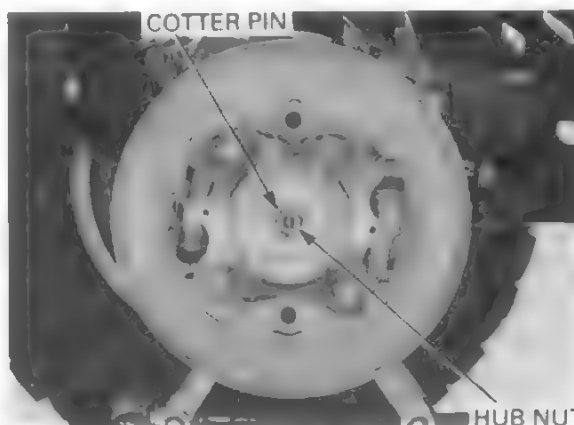
HOSE BOLT/ SEALING WASHERS



Install the wheel hub and tighten the hub nut to the specified torque.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

Install a new cotter pin.



*Face the flatter edges of the shoes to the cylinder.*

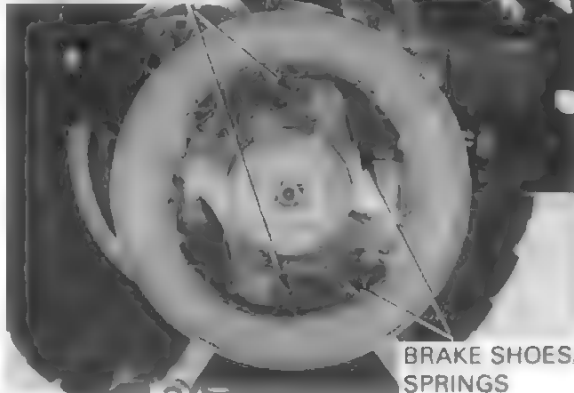
Install the brake shoes in their original positions with the shoe springs as shown.

Apply oil to the tension pin seals. Install the tension pins, tension pin seals, seal caps and pin holders.

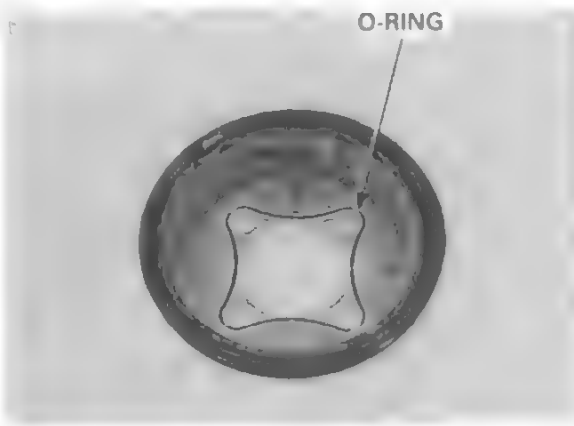
### **WARNING**

- Do not get grease on the brake drum or shoes or stopping power will be reduced.
- Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.

PINS/PIN HOLDERS



Seat an O-ring carefully in the brake drum.

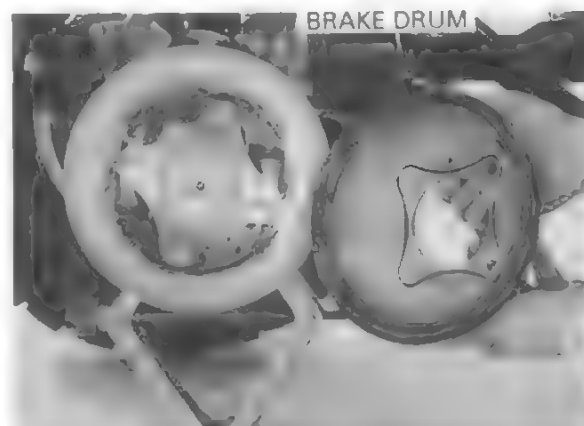


Install the brake drum.

## NOTE:

- Make sure the waterproof seal lip is packed with multipurpose grease (NLGI No.3) (see page 14-11).
- AMOUNT OF GREASE: 14 – 16 g (0.5 – 0.6 oz).

Make sure any grease is cleaned off the inside of the brake drum and brake shoe.



Install and tighten the wheel hub mounting bolts.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

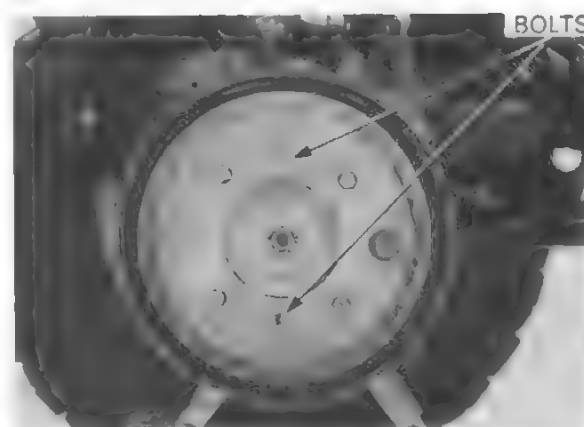
Apply grease to the dust seal and install it in the wheel hub.

Fill the reservoir to the upper level with new brake fluid (page 14-3).

Bleed the brake system (page 14-4).

Install the front wheel (page 12-3).

Adjust the brake (page 3-17).

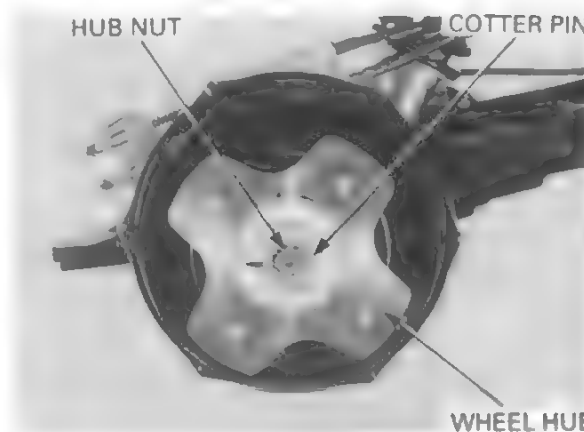


## REAR BRAKE

### REMOVAL/DISASSEMBLY

Remove the following:

- Right rear wheel (page 13-3)
- Right rear axle nut and wheel hub (page 16-3)

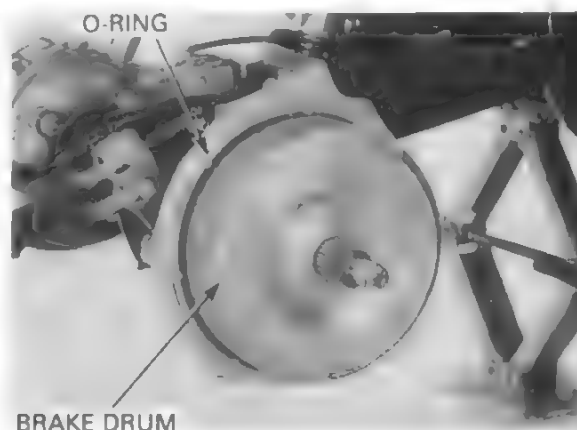


Remove the bolts and brake drum cover.



## BRAKE SYSTEM

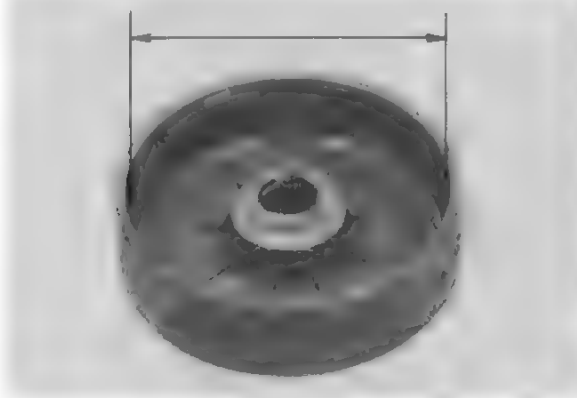
Remove the brake drum cover O-ring.  
Remove the brake drum.



Measure the brake drum I.D.

**SERVICE LIMIT: 161.0 mm (6.34 in)**

Inspect the brake drum for scoring, cracks and out of roundness.

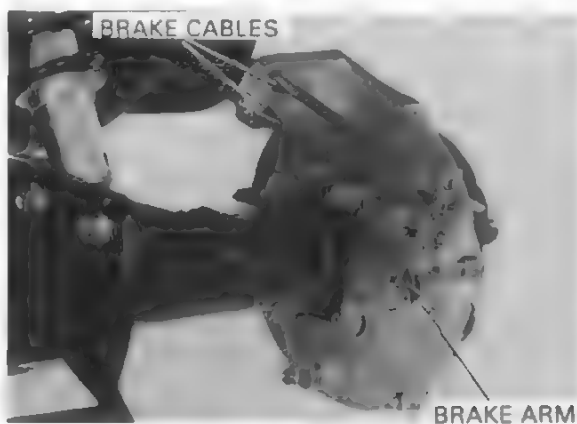


Check the brake drum cover dust seal for wear or damage.  
Drive it out of the drum cover if necessary.

For the installation of the dust seal, see page 14-22.



Remove the brake cables from the brake arm.



Remove the following:

- Cotter pin
- Washer
- Brake shoes and shoe springs

NOTE:

Mark the brake shoes to indicate their original positions before removing them.

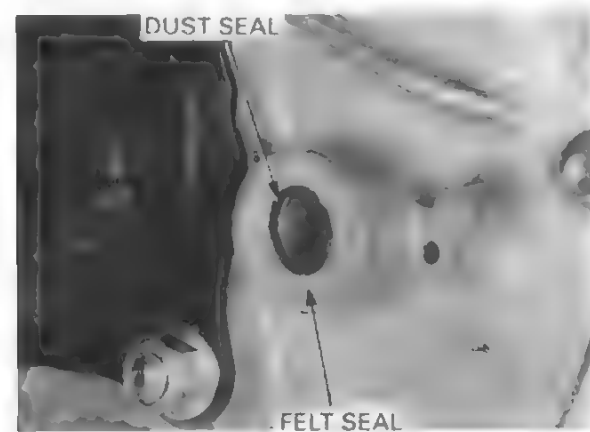


Remove the following:

- Brake arm pinch bolt/nut
- Brake arm
- Return spring
- Indicator plate
- Brake cam

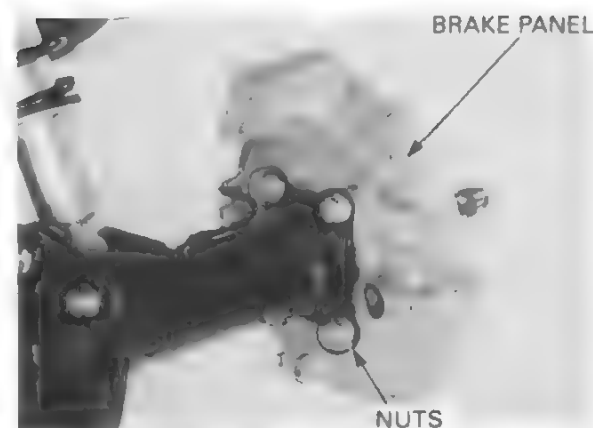


- Felt seal
- Dust seal



Remove the brake panel nuts and brake panel.  
Discard the brake panel nuts.

Remove the O-ring.

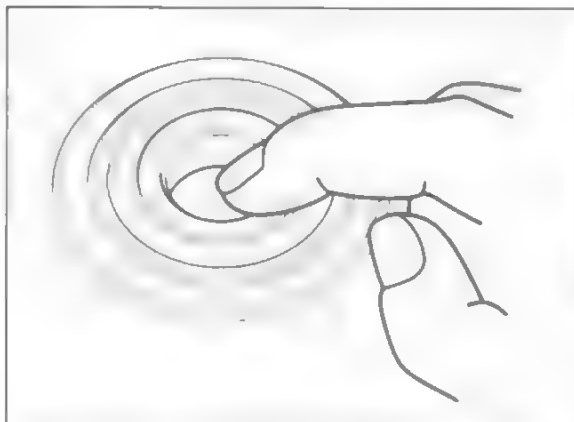




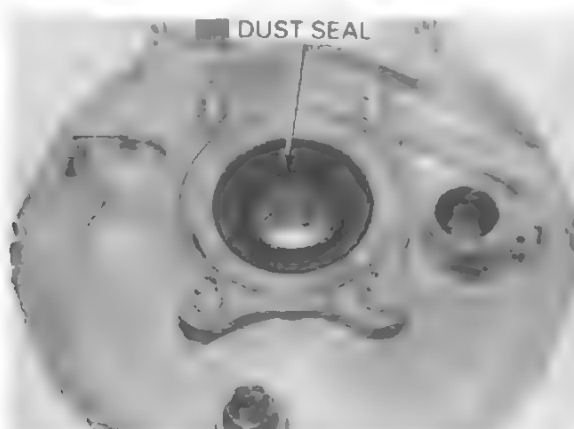
## BRAKE SYSTEM

Turn the inner race of the bearing with your finger. The bearing should turn smoothly and quietly. Also check that the outer race of the bearing fits tightly in the brake panel. Replace if necessary.

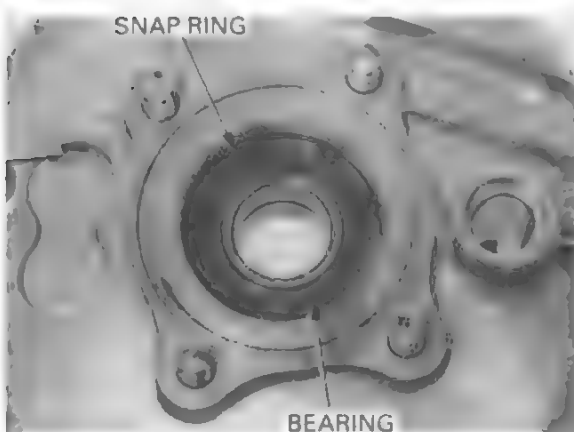
Check the dust seal for wear or damage.



Remove the dust seal.



Remove the snap ring.  
Drive the bearing out of the brake panel.



Drive the new bearing into the brake panel with its sealed side facing out (facing the axle housing) using the special tools as shown.

### TOOLS:

Driver

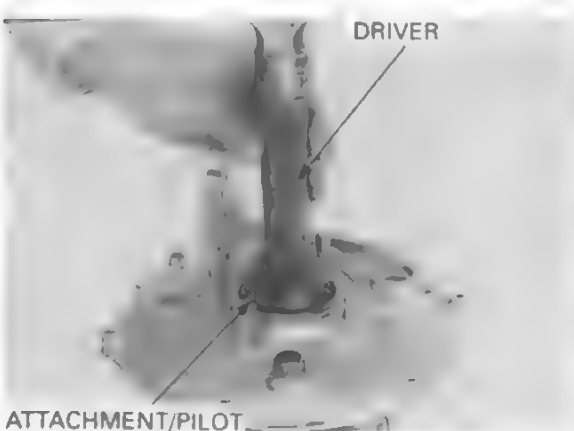
07749-0010000

Attachment, 52 X 55 mm

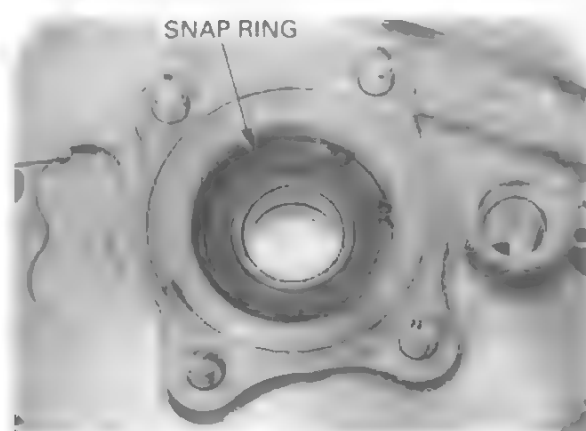
07746-0010400

Pilot, 28 mm

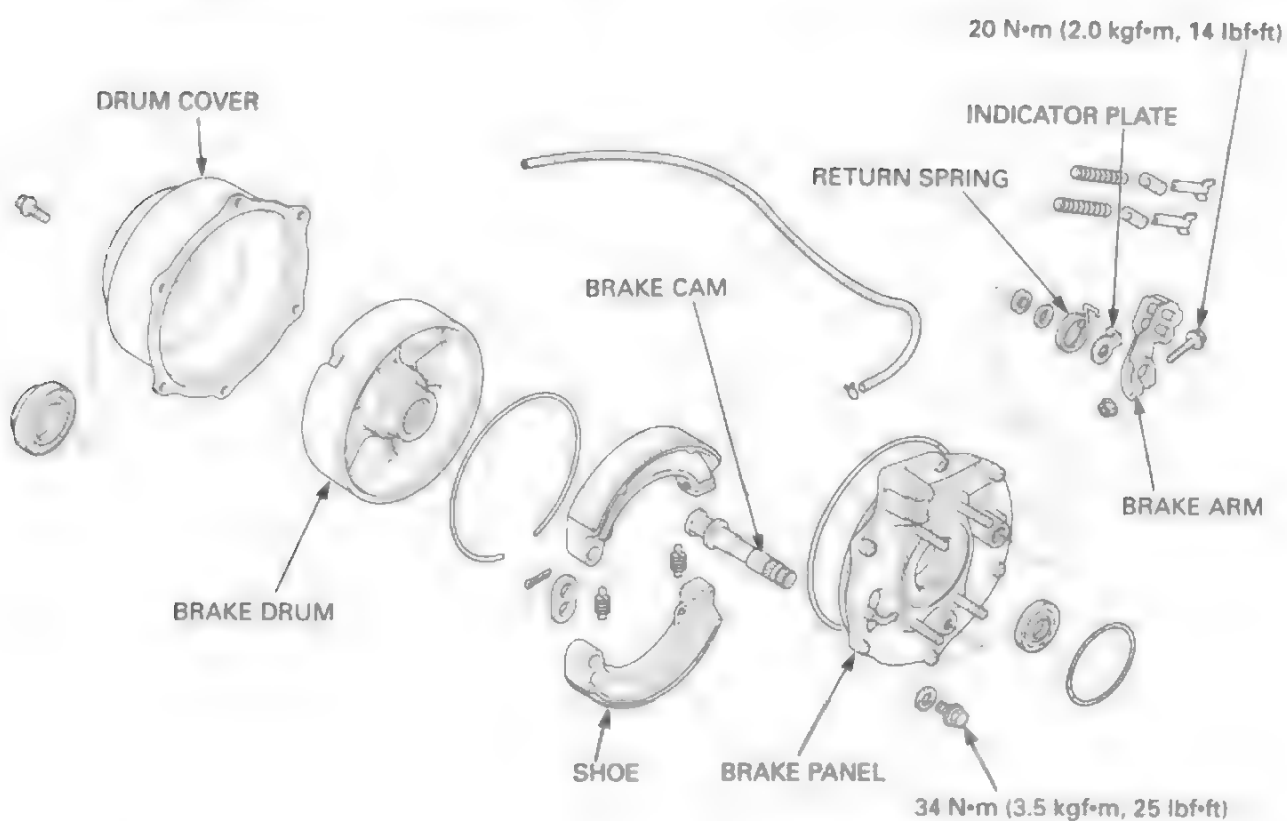
07746-0041100



Install the snap ring into the groove securely.



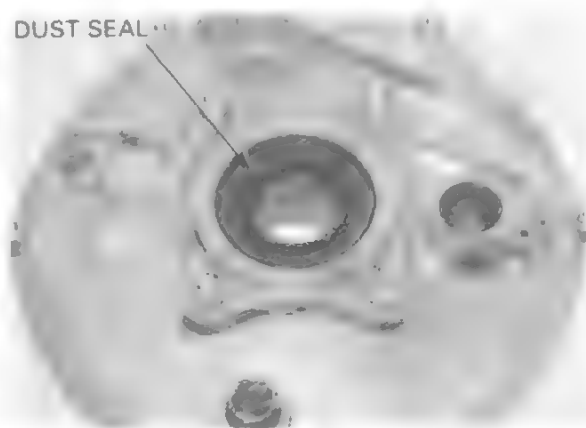
## ASSEMBLY/INSTALLATION



Pack the dust seal lip with grease and install it in the panel with the lip facing up using the special tools.  
Align the upper surfaces of the dust seal and brake panel.

### TOOLS:

Driver	07749-0010000
Attachment, 62 X 68 mm	07746-0010500



## BRAKE SYSTEM

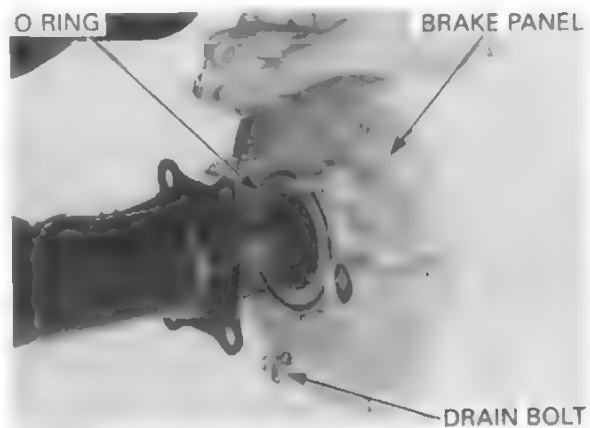
Install an O-ring in the brake panel groove securely.  
Tighten the brake panel drain bolt if removed.

### TORQUE:

'98 - '01: 34 N·m (3.5 kgf·m, 25 lbf·ft)

After '01: 12 N·m (1.2 kgf·m, 9 lbf·ft)

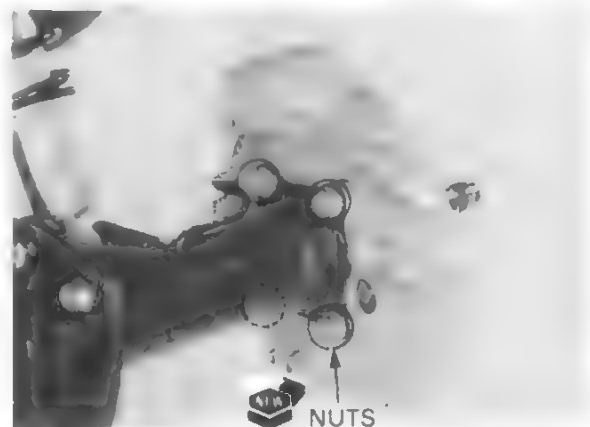
Install the brake panel onto the axle shaft.



Install and tighten the new nuts to the specified torque.

Do not reuse the nuts.

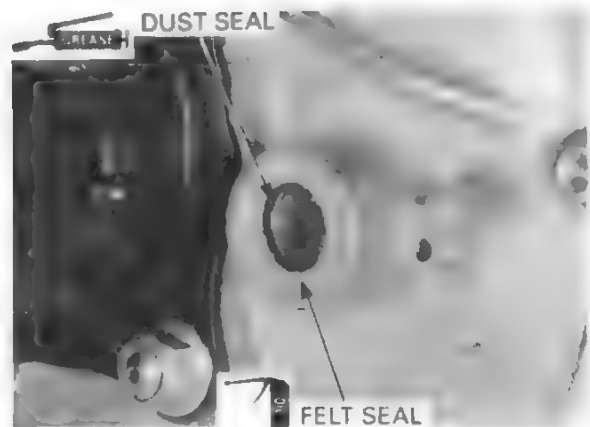
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



Apply grease to the dust seal.

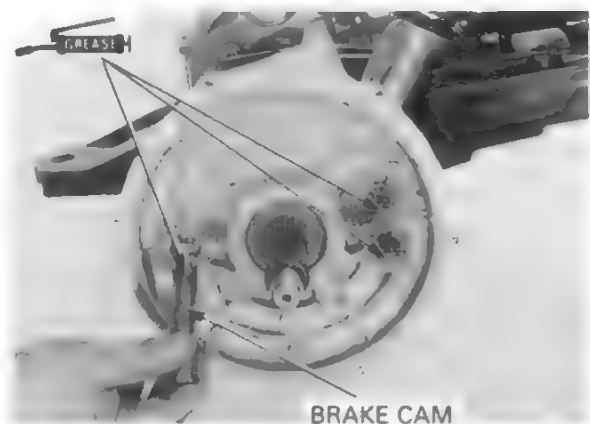
Apply oil to the felt seal.

Install the dust seals and felt seal.

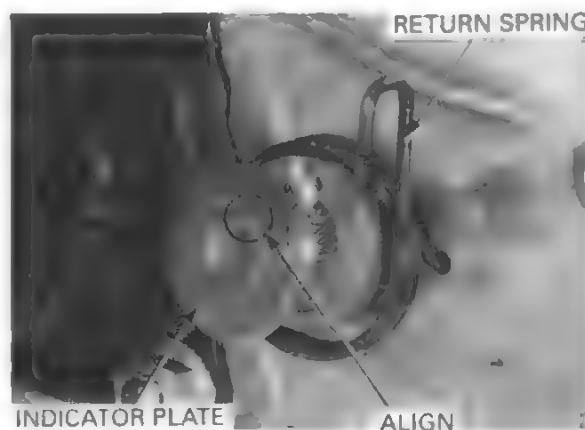


Apply grease to the anchor pin and brake cam.

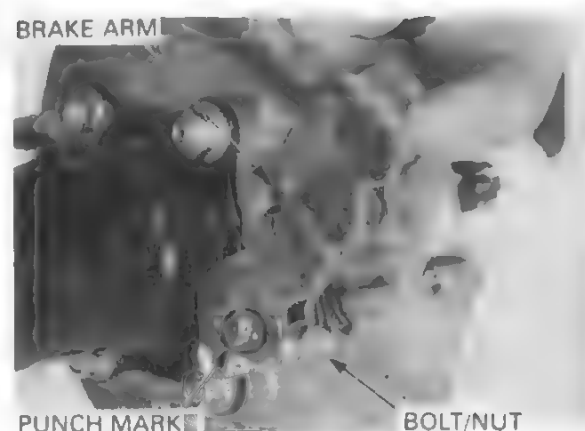
Install the brake cam from the outside.



Install the return spring and then install the indicator plate, aligning the wide tooth on the plate with the wide groove on the brake cam.



Install the brake arm, aligning the punch marks on the brake arm and cam. Hook the return spring end onto the brake arm. Tighten the brake arm bolt.



**TORQUE:** 20 N-m (2.0 kgf-m, 14 lbf-ft)

Install the brake shoes in their original positions with the spring as shown.

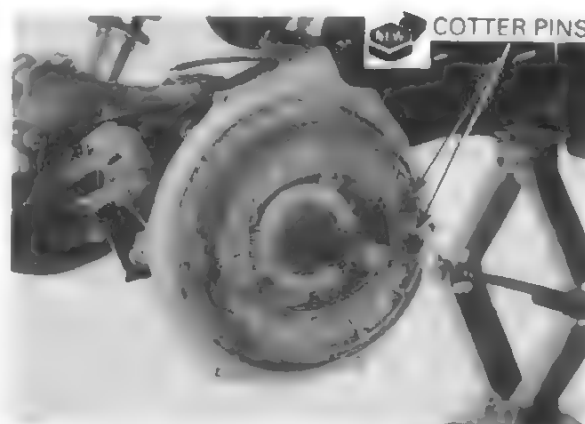
## **WARNING**

*Contaminated brake linings reduce stopping power. Keep grease off the linings, wipe excess grease off the cam.*



Install the anchor pin washer with its chamfered side (rolled edge side) facing in.

Install new cotter pins as shown.

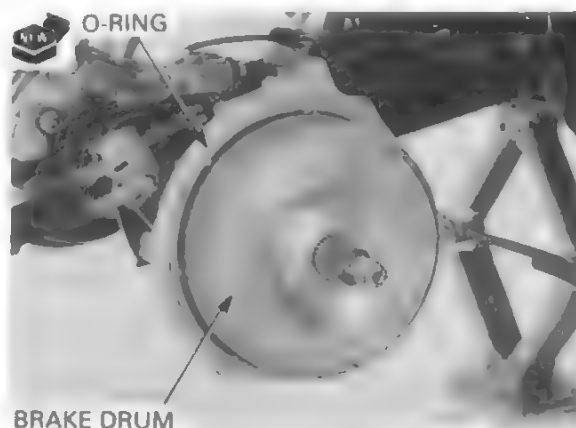


## BRAKE SYSTEM

Install the brake cables to the brake arm.

Apply grease to the brake drum splines.  
Install the brake drum.

Install a new O-ring onto the brake panel.

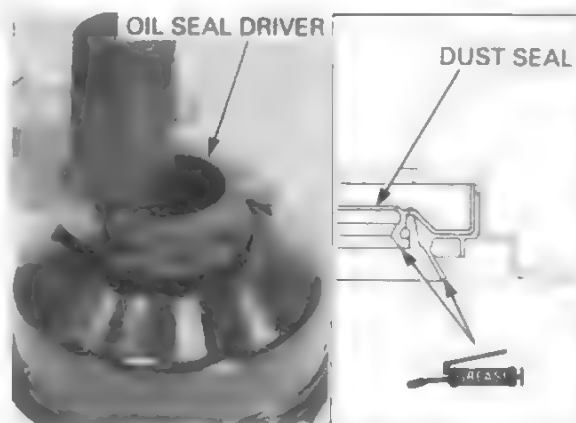


Apply grease to the dust seal lip.  
Install a new dust seal into the drum cover using the special tool as shown.

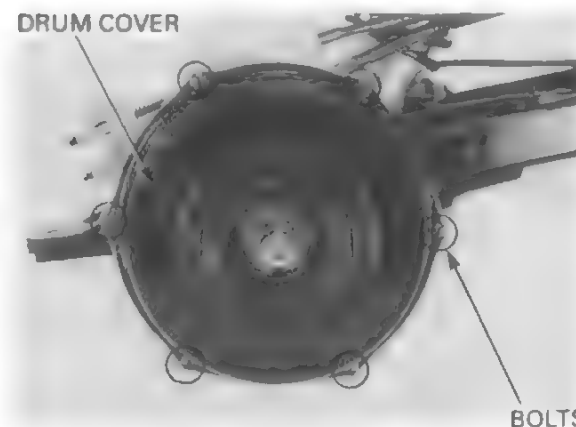
**TOOL:**

Oil seal driver

07965-MC70100



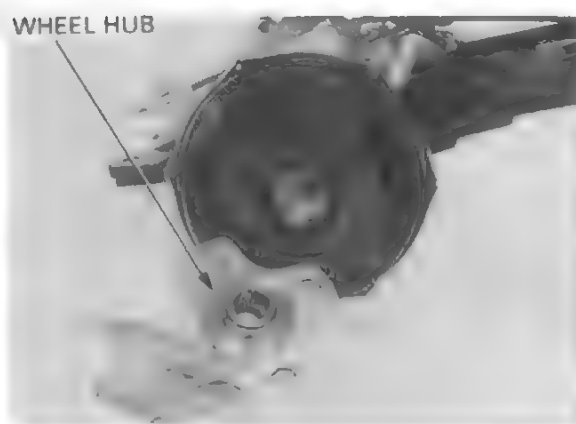
Install the drum cover and tighten the bolts.



Clean the mating surface of the right rear wheel hub and brake cover dust seals.  
Install the rear wheel hub, axle nut and cotter pin (page 16-20).

Install the right rear wheel (page 13-3).

Adjust the rear brake lever and pedal free play (page 3-17).



## BRAKE PEDAL

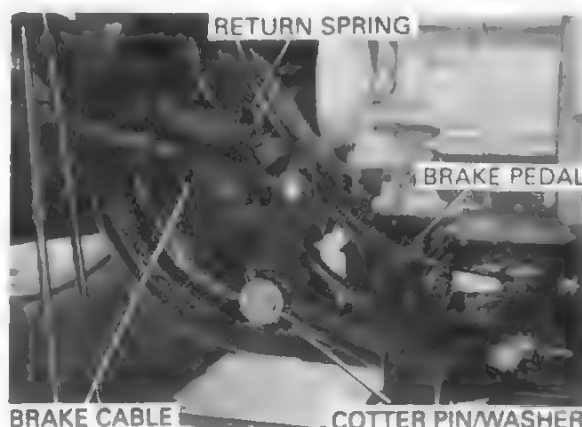
### REMOVAL

Loosen and remove the rear brake pedal adjusting nuts.

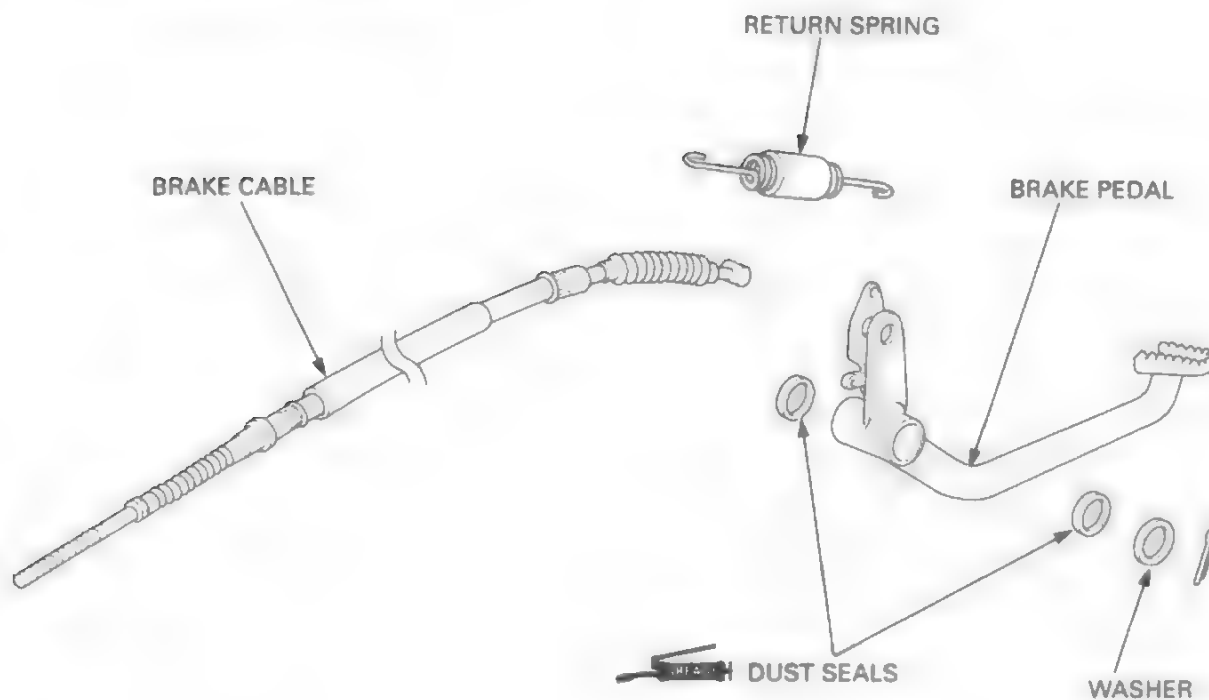


Disconnect the brake cable from the bracket and unhook the return spring. Remove the cotter pin and washer from the pedal pivot shaft, and then remove the brake pedal from the shaft.

Unhook the brake cable from the brake pedal.



### INSTALLATION

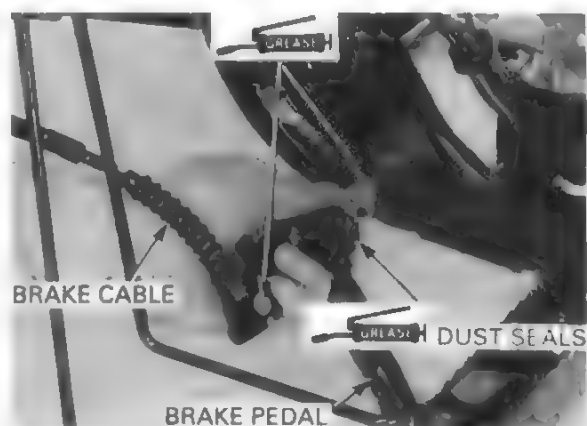


## BRAKE SYSTEM

Apply grease to the brake pedal pivot shaft, dust seals and brake cable end.

Connect the brake cable to the brake pedal.

Install the brake pedal onto the pivot.



Connect the brake cable onto the bracket and hook the return spring.

Install the washer and new cotter pin.  
Adjust the rear brake (page 3-17).



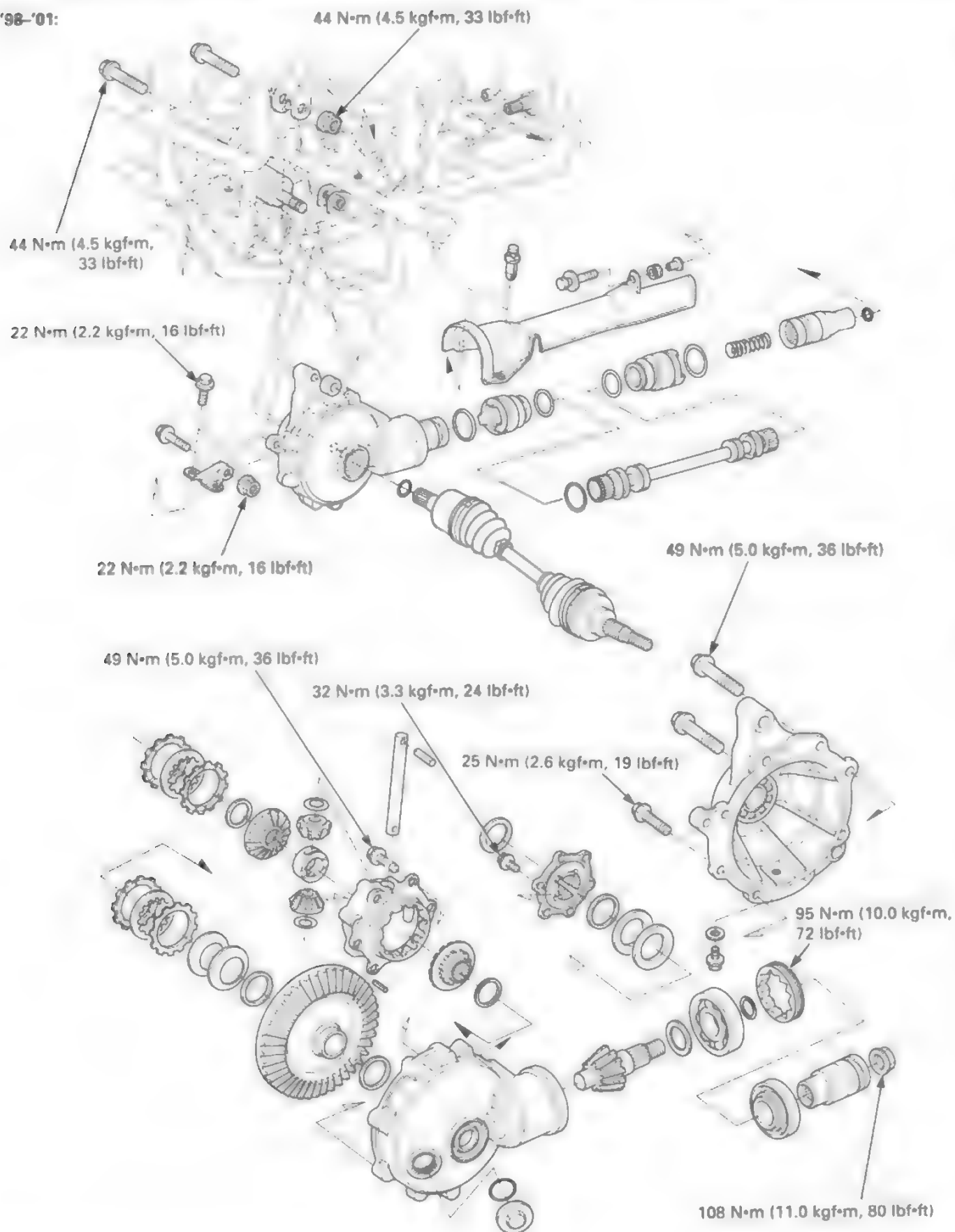
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MEMO



## FRONT DRIVING MECHANISM

'98-'01:



# 15. FRONT DRIVING MECHANISM

## SERVICE INFORMATION

15-2

## FRONT DRIVE SHAFT

15-4

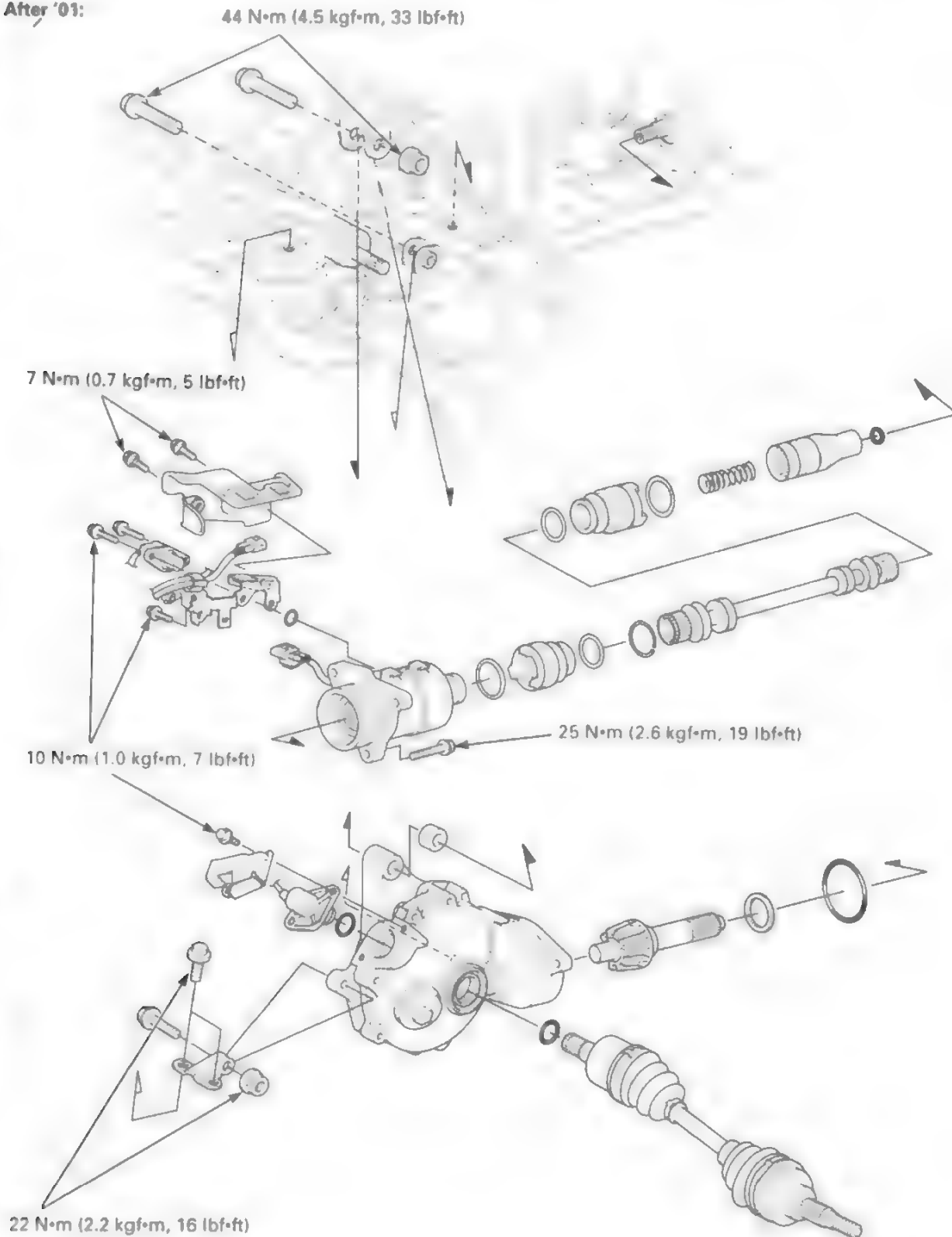
## TROUBLESHOOTING

15-3

## FRONT DIFERENTIAL

15-10

After '01:



## SERVICE INFORMATION

## GENERAL

- Replace all oil seals and O-rings whenever the front differential assembly is disassembled.
- Check the tooth contact pattern and gear backlash when the front differential bearing, gear set and/or gear case are replaced.

## After '01:

- Replace the ring and pinion gears as a set.
- Replace the cam followers (12 pieces) as a set, and the cam followers, face cams and differential housing halves as an assembly if the face cam, differential housing or cap is faulty.

## SPECIFICATIONS ('98 - '01)

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Oil capacity	After draining	190 cm <sup>3</sup> (6.4 US oz, 6.7 Imp oz)	—
	At disassembly	200 cm <sup>3</sup> (6.8 US oz, 7.0 Imp oz)	—
Recommended oil		Hypoid gear oil SAE #80	—
Clutch spring free height		2.65 (0.104)	2.5 (0.10)
Clutch disc thickness	A	2.7 - 2.8 (0.106 - 0.110)	2.4 (0.09)
	B	2.3 - 2.4 (0.091 - 0.090)	2.1 (0.08)
Pinion gear I.D.		12.000 - 12.018 (0.4724 - 0.4731)	12.05 (0.474)
Pinion gear shaft O.D.		11.973 - 11.984 (0.4714 - 0.3718)	11.75 (0.463)
Slip torque		17 - 25 N·m (1.7 - 2.5 kgf·m, 12 - 18 lbf·ft)	—
Gear backlash		0.05 - 0.30 (0.002 - 0.012)	0.40 (0.016)

## SPECIFICATIONS (After '01)

Unit: mm (in)

ITEM		STANDARDS	SERVICE LIMIT
Oil capacity	After draining	241 cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)	—
	At disassembly	275 cm <sup>3</sup> (9.3 US oz, 9.7 Imp oz)	—
Recommended oil		Hypoid gear oil SAE #80	—
Gear backlash		0.05 - 0.25 (0.002 - 0.010)	0.4 (0.02)
Backlash difference		—	0.2 (0.01)
Slip torque		14 - 17 N·m (1.45 - 1.75 kgf·m, 10 - 13 lbf·ft)	12 N·m (1.2 kgf·m, 9 lbf·ft)
Face cam-to-housing distance		6.3 - 6.7 (0.25 - 0.26)	6.3 (0.25)
Differential housing cap depth		9.55 - 9.65 (0.376 - 0.380)	9.55 (0.376)
Cone spring free height		2.8 (0.11)	2.6 (0.10)

## TORQUE VALUES

Differential case mounting bolt, 10 mm	44 N·m (4.5 kgf·m, 33 lbf·ft)	
8 mm	22 N·m (2.2 kgf·m, 16 lbf·ft)	
Differential case cover flange bolt, 8 mm	25 N·m (2.6 kgf·m, 19 lbf·ft)	
10 mm	49 N·m (5.0 kgf·m, 36 lbf·ft)	Apply a locking agent.
Pinion joint nut ('98 - '01)	108 N·m (11.0 kgf·m, 80 lbf·ft)	Apply a locking agent.
Pinion bearing lock nut ('98 - '01)	98 N·m (10.0 kgf·m, 72 lbf·ft)	
Differential gear case drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Differential gear case cover oil cap	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Differential case cap Torx bolt ('98 - '01)	32 N·m (3.3 kgf·m, 24 lbf·ft)	Replace with new ones.
Differential case USB bolt ('98 - '01)	49 N·m (5.0 kgf·m, 36 lbf·ft)	
Differential ring gear bolt (After '01)	49 N·m (5.0 kgf·m, 36 lbf·ft)	Replace with new ones.
Speed sensor mounting bolt (After '01)	10 N·m (1.0 kgf·m, 7 lbf·ft)	
Final clutch speed sensor mounting bolt (After '01)	10 N·m (1.0 kgf·m, 7 lbf·ft)	
Final clutch mounting bolt (After '01)	25 N·m (2.6 kgf·m, 19 lbf·ft)	
Final clutch cover bolt (After '01)	9 N·m (0.9 kgf·m, 7 lbf·ft)	

## TOOLS

Differential inspection tool	07KMK-HC50101	or 07KMK-HC5010A (U.S.A. only)
Pinion holder ('98 - '01)	07SMB-HM70200	
Lock nut wrench, 30 X 64 mm ('98 - '01)	07916-MB00002	or 07916-MB00001
Pinion puller set ('98 - '01)	07HMC-MM80101	not available in U.S.A.
- Shaft puller	07931-ME40000	or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
- Pinion puller base	07HMC-MM80110	or 07HMC-MM8011A (U.S.A. only)
Driver attachment ('98 - '01)	07965-KE80200	
Ball joint remover, 28 mm	07MAC-SL00200	
Driver	07749-0010000	
Attachment, 52 X 55 mm	07746-0010400	
Pilot, 28 mm	07746-0041100	
Driver, 40 mm I.D. ('98 - '01)	07746-0030100	
Driver, 22 mm I.D. (After '01)	07746-0020100	
Attachment, 25 mm I.D. ('98 - '01)	07746-0030200	
Attachment, 15 mm I.D. (After '01)	07746-0020200	
Pilot, 15 mm (After '01)	07746-0040300	
Pilot, 14 mm (After '01)	07746-0041200	
Attachment, 22 X 24 mm (After '01)	07746-0010800	
Attachment, 30 mm I.D. (After '01)	07746-0030300	
Oil seal driver (After '01)	07965-KE80100	
Adjustable bearing puller (After '01)	07JAC-PH80101	
Remover shaft (After '01)	07JAC-PH80200	
Sliding weight (After '01)	07741-0010201	

### TROUBLESHOOTING

#### Consistent noise during cruising

- Oil level too low
- Foreign matter contaminating gear oil
- Improper tooth contact between ring gear and drive pinion
- Worn or damaged ring gear bearing
- Worn or damaged ring gear and drive pinion
- Worn pinion shaft or pinion gear side washer
- Deformed ring gear or differential case
- Chipped or damaged gears

#### Gear noises while running

- Oil level too low
- Foreign matter contaminating gear oil
- Chipped or damaged gears
- Improper tooth contact between ring gear and drive pinion

#### Gear noises while coasting

- Damaged or chipped gears

#### Bearing noises while running and coasting

- Cracked or damaged drive pinion bearing or ring gear

#### Abnormal noises when turning ('98 - '01)

- Worn (excessive play) or damaged ring gear bearing
- Damaged side gear, pinion or pinion shaft
- Worn clutch disc/plate
- Worn clutch spring
- Worn or damaged slots of the differential housing

#### Abnormal noises when turning (After '01)

- Worn or damaged ring gear bearing
- Worn or damaged face cam and cam follower
- Worn or damaged differential housing groove
- Worn cone spring or shim

#### Abnormal noises at start or during acceleration

- Excessive backlash between ring gear and drive pinion
- Excessive pinion gear backlash
- Worn differential splines
- Loose pinion joint nut ('98 - '01) and other fasteners
- Worn clutch disc/plate ('98 - '01)
- Worn clutch spring ('98 - '01)
- Worn cone spring or shim (After '01)

#### Oil leak

- Oil level too high
- Clogged breather hole or tube
- Worn or damaged oil seal
- Loose differential cover bolt

#### Overheating

- Oil level too low
- Insufficient backlash between ring gear and drive pinion

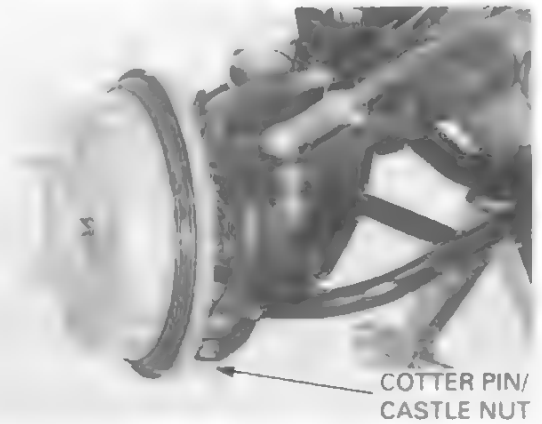
## FRONT DRIVE SHAFT

## REMOVAL

Remove the following:

- Front wheel (page 12-3)
- Front brake drum (page 14-7)
- Cotter pins

Loosen the castle nut, but do not remove it.



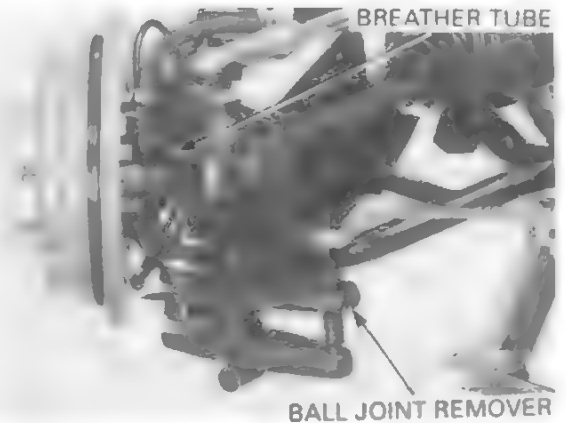
Separate the knuckle from the lower suspension arm, according to the page 12-14 instructions.

## TOOL:

Ball joint remover, 28 mm 07MAC-SL00200

Remove the castle nut.

Disconnect the breather tube from the brake panel.



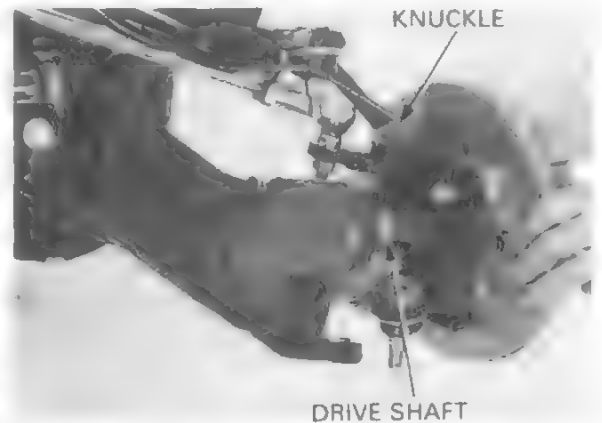
Separate the knuckle/brake panel assembly from the drive shaft.

## CAUTION:

*Support the knuckle/brake panel assembly so that it does not hang from the brake hose. Do not twist the brake hose.*

## NOTE:

Do not operate the front brake lever after removing the knuckle/brake panel assembly. If you do it, the pistons are pushed from the cylinder.



Pry the driveshaft assembly with a screwdriver to force the set ring at the driveshaft end past the groove.

Hold the inboard joint as shown and pull the drive shaft out of the differential.

## CAUTION:

- *To prevent damage to the differential oil seal, hold the inboard joint horizontal until the drive shaft is clear of the differential.*
- *Use care when prying out the assembly, and pull it straight to avoid damaging the differential oil seal.*



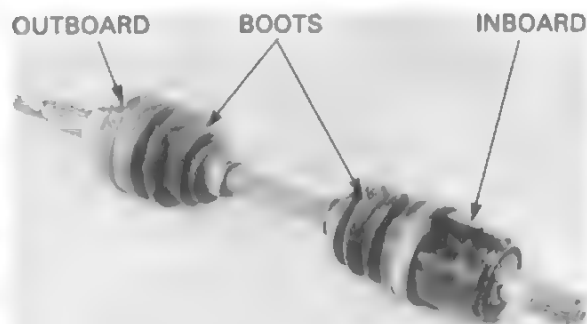
### INSPECTION

Check the boot for cuts or other damage; replace if necessary.

Check the drive shaft joints for excessive play or noise by moving the joints in a circular direction.

If the outboard joint seems to be worn or damaged, the drive shaft must be replaced.

To service the inboard joint, follow the DISASSEMBLY steps below.



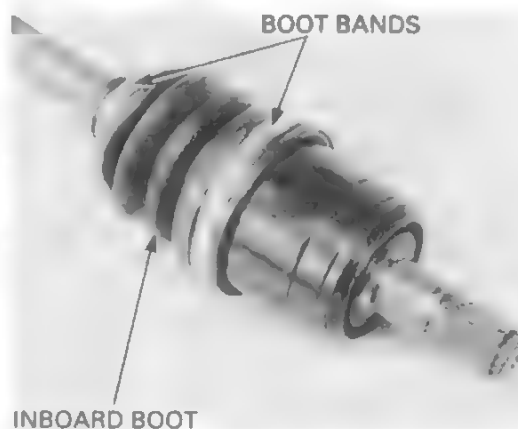
### DISASSEMBLY

#### NOTE:

To replace the outboard boot, first remove the inboard boot as described in these steps. Then remove the bands and pull the outboard boot off the inboard end of the shaft.

Loosen both boot bands on the inboard side, and remove boot band A.

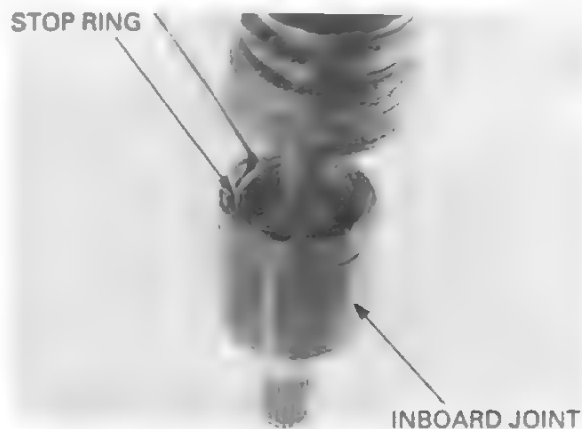
Pull the boot off the inboard joint.



Remove the stop ring and inboard joint.

#### NOTE:

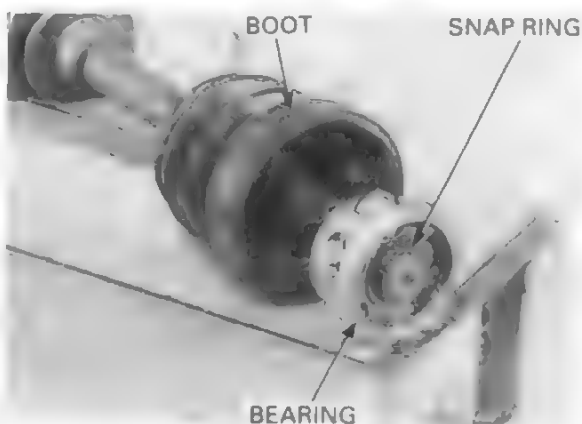
The outboard joint cannot be disassembled.



Remove the snap ring and bearing.  
Remove the boot band B and pull the boot off the drive shaft.

#### NOTE:

Replace the bands with new ones whenever removing them.



Check the following for wear or damage.

- Bearing cage
- Bearing race
- Steel balls

BEARING CAGE

BEARING RACE

STEEL BALL

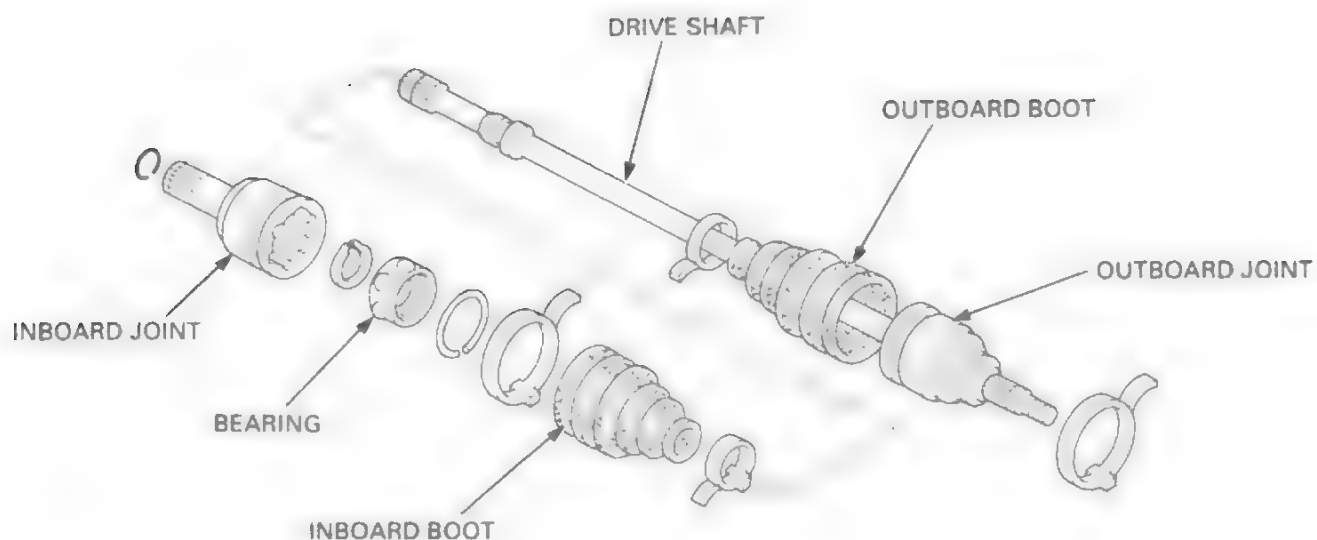
- Inboard joint

## NOTE:

Replace the bearing cage, bearing race, steel balls and inboard joint as an assembly.

INBOARD JOINT

## ASSEMBLY

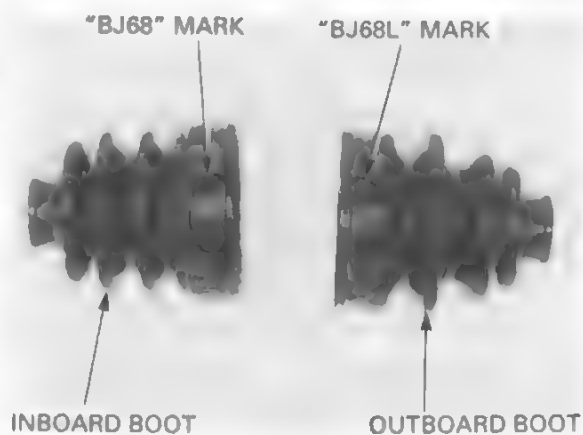




## FRONT DRIVING MECHANISM

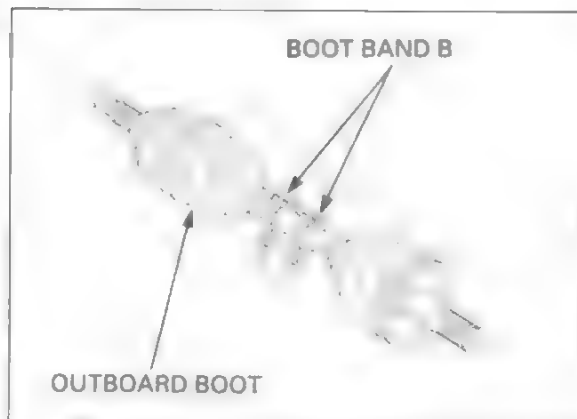
### NOTE:

The boots are marked "BJ68L" for the outboard joint and "BJ68" for the inboard joint.



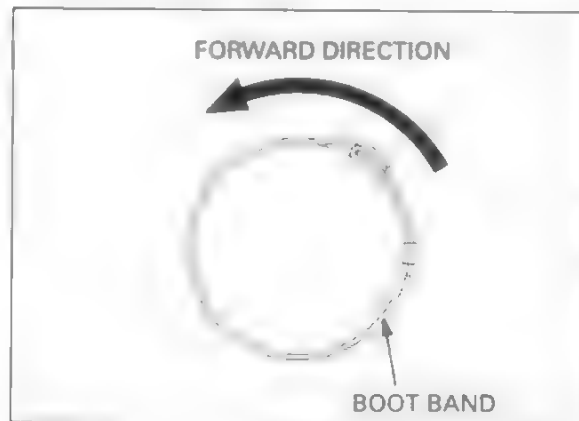
If the outboard boot was removed, install it on the drive shaft with a new boot band B (2 pieces).

Install the inboard boot with a boot band B. Do not tighten the bands at this time.

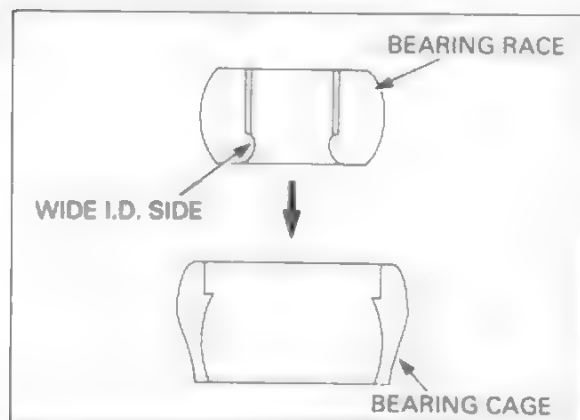


### NOTE:

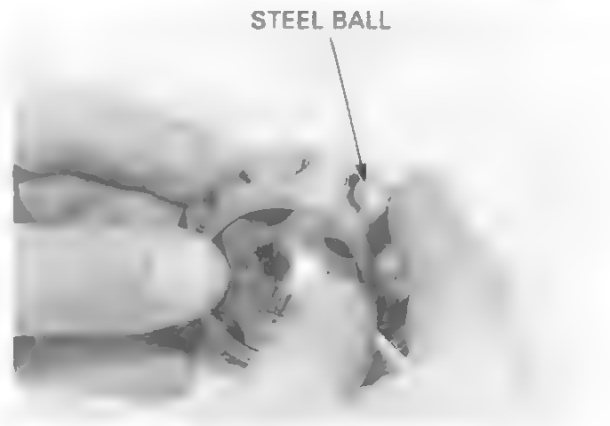
Note the direction of the boot bands.



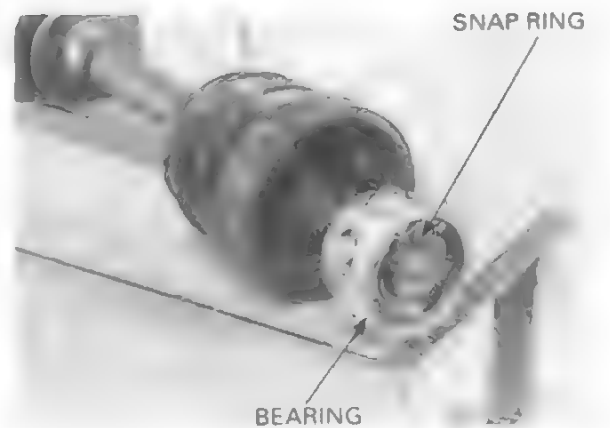
Install the bearing race in the bearing cage as shown.



Push the steel balls into the bearing cage.

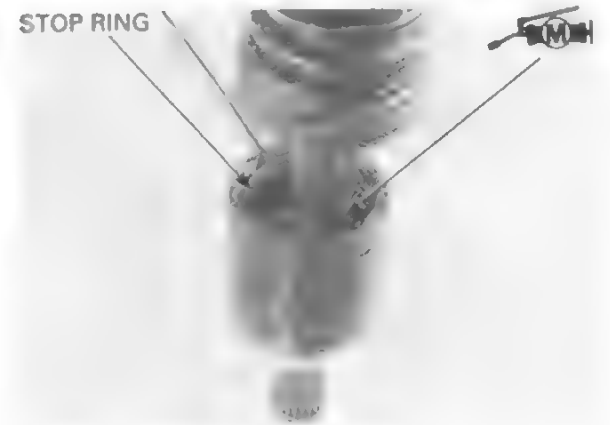


Install the bearing on the drive shaft with the small end of the bearing facing the inside of the drive shaft. Install the snap ring securely in the groove of the drive shaft.



Apply molybdenum disulfide grease to the bearing and inside of the inboard joint.

Install the inboard joint to the drive shaft. Install the stop ring in the joint groove.

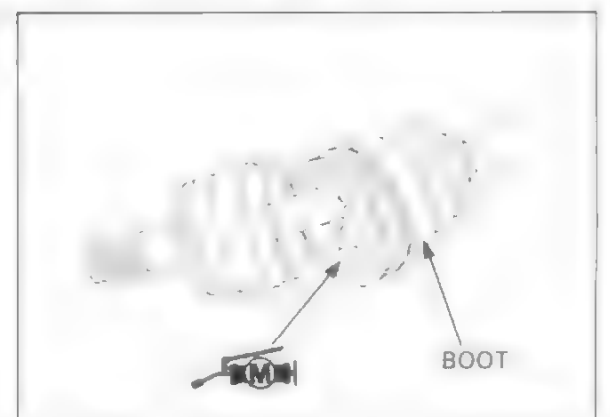


Pack the boots with molybdenum disulfide grease and pull them on the joints.

## GREASE CAPACITY:

Inboard boot: 40 - 60 g (1.4 - 2.0 oz)

Outboard boot: 30 - 50 g (1.1 - 1.7 oz)



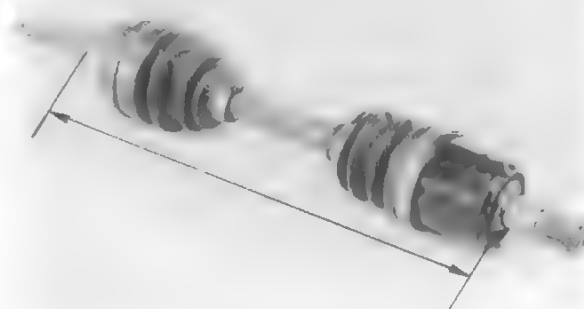
## FRONT DRIVING MECHANISM

Adjust the length of the drive shaft to the figure given below.

### DRIVE SHAFT LENGTH:

Right : 342 – 352 mm (13.5 – 13.9 in)

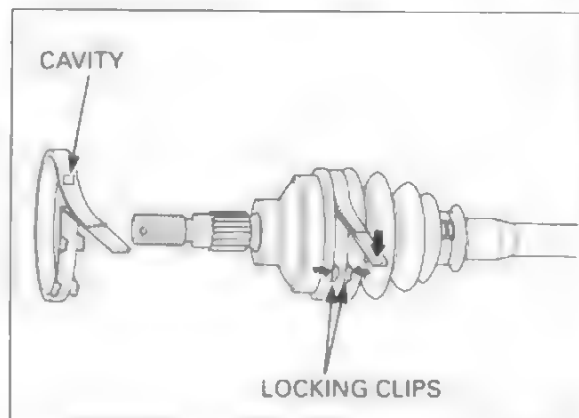
Left : 382 – 392 mm (15.0 – 15.4 in)



Install the bands with their tabs facing rearward.

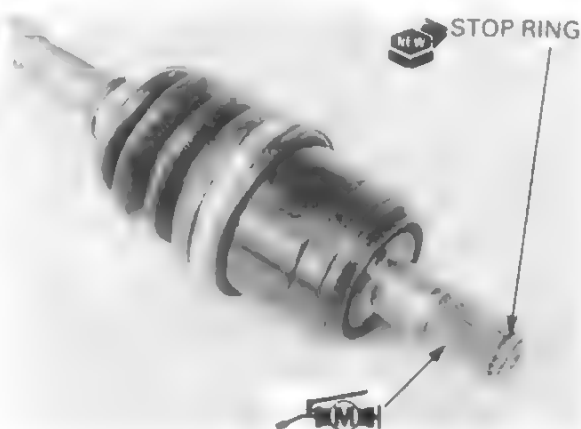
Secure the new boot bands as follows:

1. Bend down the tab of the boot band.
2. Secure the bent down tab with the locking clips and tap them with a plastic hammer.



Install a new stop ring in the groove on the inboard joint.

Apply molybdenum disulfide grease to the splines of the inboard joint.



## INSTALLATION

Install the drive shaft in the differential while holding the inboard joint.

After installing, pull the joint a little to make sure that the stop ring is locked in the differential side gear groove.



Install the knuckle/brake panel assembly.  
Tighten the castle nut to the specified torque.

**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**

Install a new cotter pin.

Connect the breather hose.

Install the following:

- Front brake drum (page 14-15)
- Front wheel (page 12-3)



## FRONT DIFFERENTIAL

### REMOVAL

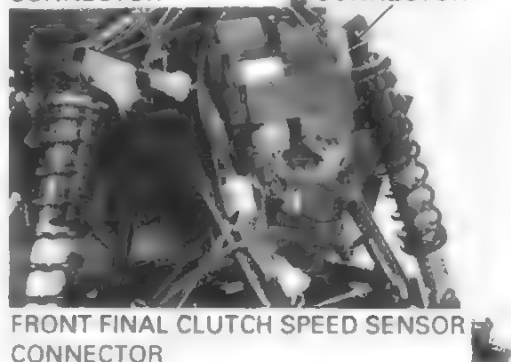
Drain the front differential oil (page 3-13)

*After '01*

Disconnect the following connectors:

- front final clutch speed sensor
- meter speed sensor
- front final clutch

METER SPEED SENSOR CONNECTOR FRONT FINAL CLUTCH CONNECTOR

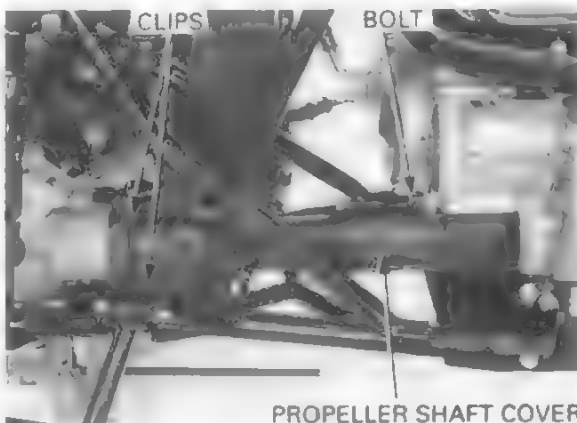


Remove the following:

- Air vent hose
- One front drive shaft (page 15-3)
- Front fender (page 2-6)

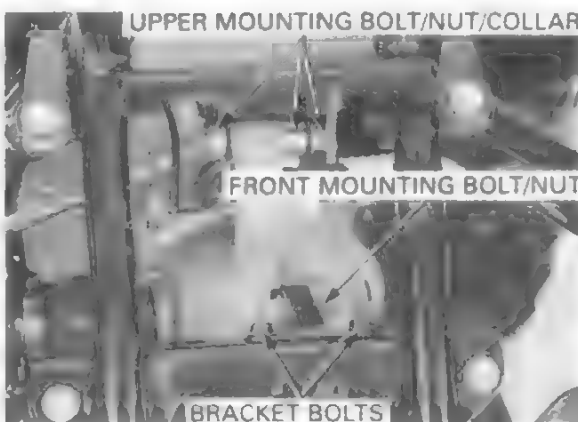
*'98 - '01*

Remove the bolt, retaining clips and propeller shaft cover.



Remove the following:

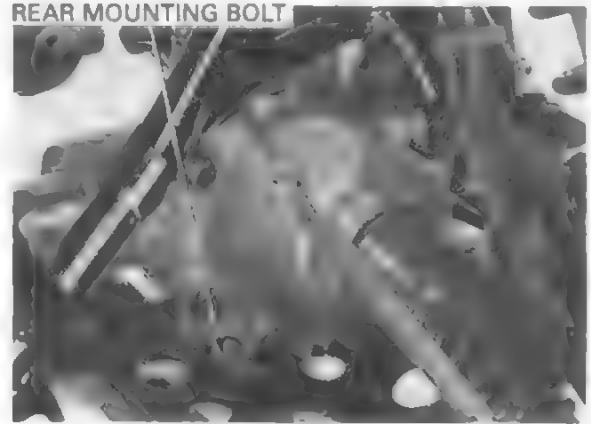
- Upper mounting nut, bolt and collar
- Front differential mounting bolt and nut
- Front differential mounting bracket bolts and bracket



## FRONT DRIVING MECHANISM

- Rear mounting bolt

REAR MOUNTING BOLT



Push the front differential forward.  
Pull the propeller shaft joint forward, then separate the propeller shaft from the engine.

Remove the propeller shaft from the front differential.

Remove the front differential.  
Separate the other drive shaft from the differential as you remove it.

PROPELLER SHAFT JOINT

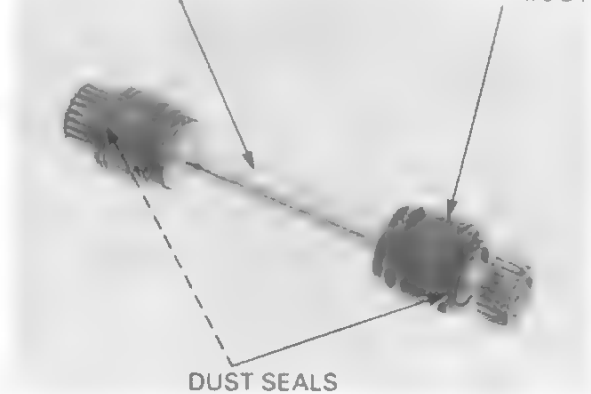


### INSPECTION

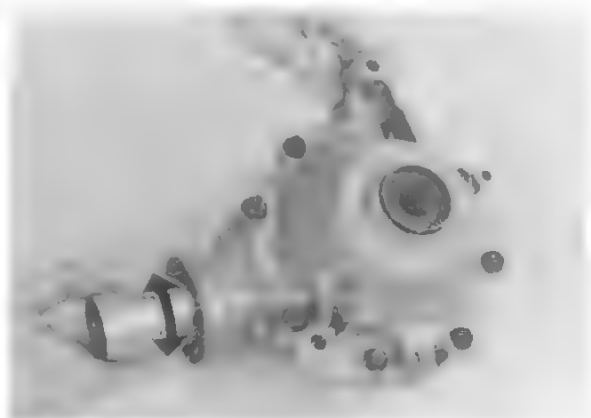
Remove the dust boot.  
Check the propeller shaft for wear or damage.  
Check the dust seals for wear or damage, replace if necessary.

PROPELLER SHAFT

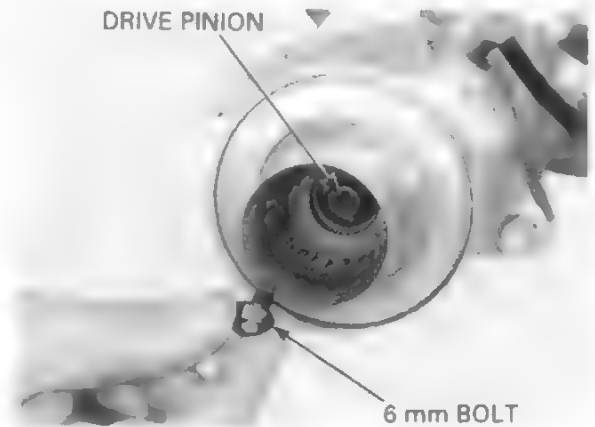
DUST BOOT



98 - '01 Turn the differential drive pinion joint with your finger; it should turn smoothly and quietly.



*After '01*  
The 6 mm bolt  
will lock the  
differential  
so it can  
be inspected



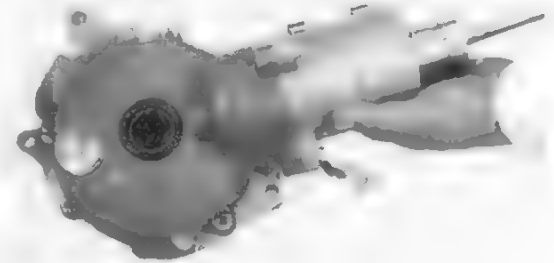
*After '01* Turn the 6 mm bolt on the drive pinion and check that the gear turns smoothly and quietly without binding.

Inspect the following if the drive pinion does not turn smoothly and quietly.

- Differential case
- Ring gear bearings
- Drive pinion
- Ring gear

Proceed with the detailed inspection procedures that follow and replace faulty parts/assemblies as required.

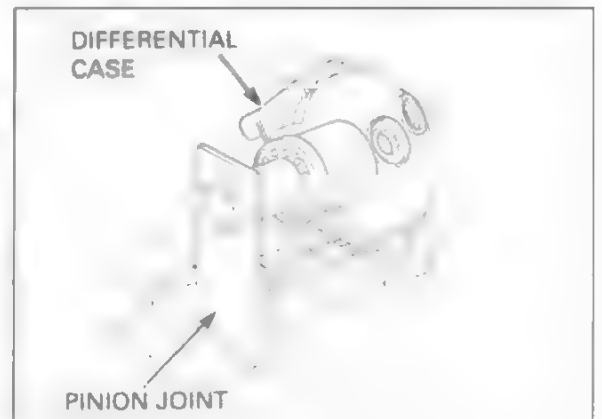
Remove the 6 mm bolt.



## BACKLASH INSPECTION ('98 - '01)

Remove the oil filler cap.  
Set the differential case in a vise and hold the pinion joint as shown.

**TOOL:**  
Pinion joint holder 07SMB-HM70200



Set a horizontal type dial indicator on the ring gear, through the oil filler hole.  
Install the differential inspection attachment into the right side of the differential gear and rotate the differential assembly/ring gear by turning the differential inspection tool by hand until gear slack is taken up.  
Turn the ring gear back and forth to read the backlash.

**STANDARD:** 0.05 - 0.30 mm (0.002 - 0.012 in)  
**SERVICE LIMIT:** 0.40 mm (0.016 in)

**TOOL:**  
Differential inspection tool 07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)



Remove the dial indicator.  
Turn the ring gear and measure the backlash.  
Repeat this procedure once more.  
Compare the difference of the three measurements.

### DIFFERENCE OF MEASUREMENT SERVICE LIMIT: 0.25 mm (0.010 in)

If the difference in measurements exceeds the limit it indicates that either the bearing is not installed squarely, or the case is deformed.

Inspect each bearing and case.

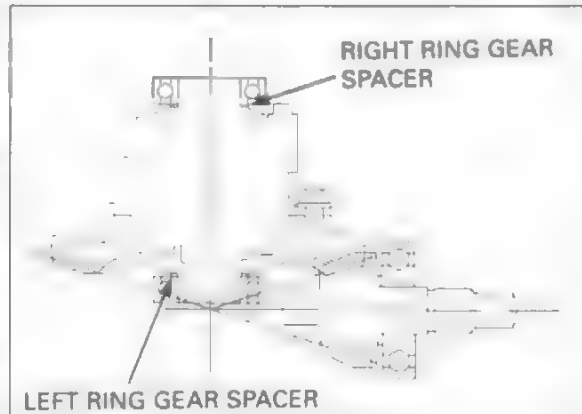
If backlash is too small, replace the ring gear left side spacer with a thicker one.  
Backlash is changed by about 0.06 mm (0.002 in) when thickness of the spacer is changed by 0.10 mm (0.004 in).

#### RING GEAR SPACERS:

Twenty-three spacers (from A to W), are available in thickness intervals of 0.05 mm.

- Standard: 1.00 mm (0.039 in)
- Thinnest: 0.50 mm (0.020 in)
- Thickest: 1.60 mm (0.063 in)

Replace the right side spacer with a spacer that is the opposite thickness of the new left side spacer.  
For example, if the left spacer was replaced with a 0.10 mm (0.004 in) thicker spacer, replace the right spacer with one that is 0.10 mm (0.004 in) thinner.



### BACKLASH INSPECTION (After '01)

Hold the pinion gear with the 6 mm bolt.

Set the differential case into a jig or vise with soft jaws.  
Install the differential inspection tool into the right side of the differential.

#### TOOL:

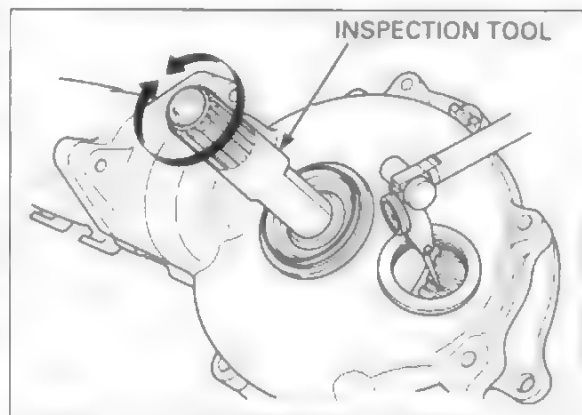
Differential inspection tool 07KMK-HC50101 or  
07KMK-HC5010A  
(U.S.A. only)

Remove the oil filler cap and set a horizontal type dial indicator on the ring gear through the filler hole.  
Turn the ring gear back and forth to read the backlash.

**STANDARD:** 0.05 – 0.25 mm (0.002 – 0.010 in)  
**SERVICE LIMIT:** 0.4 mm (0.02 in)

Remove the dial indicator. Turn the ring gear 120° and measure the backlash. Repeat this procedure once more.  
Compare the difference of the three measurements.

**SERVICE LIMIT:** 0.2 mm (0.01 in)



If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.

If the backlash is excessive, replace the ring gear left side shim with a thinner one.

If the backlash is too small, replace the ring gear left side shim with a thicker one.

Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.10 mm (0.004 in).

## NOTE:

- Shims are available in 23 different thicknesses, from 0.50 mm (shim A) to 1.60 mm (shim W) in increments of 0.05 mm.

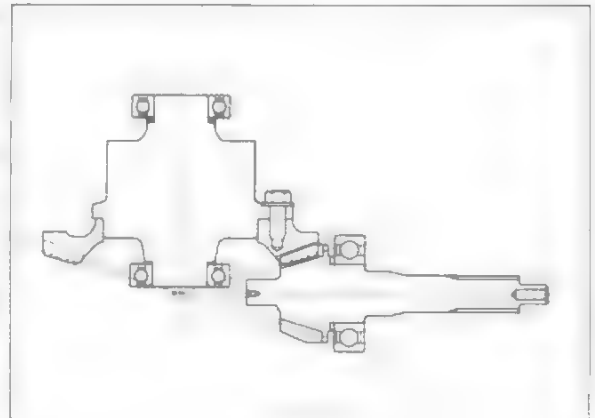
## Ring gear shims:

**A: (thinnest): 0.50 mm (0.020 in) –**

**K: (standard): 1.00 mm (0.039 in) –**

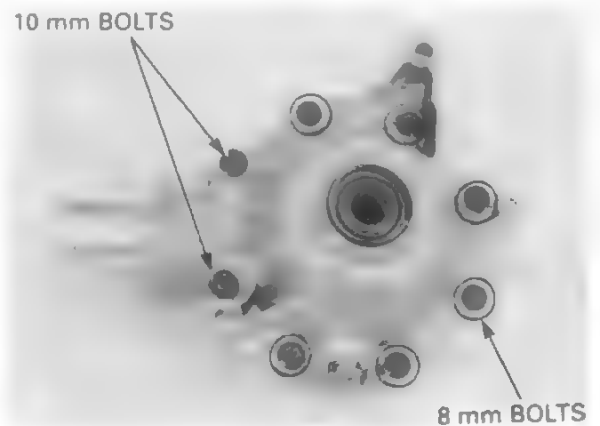
**W: (thinnest): 1.60 mm (0.063 in) –**

Replace the right side spacer with a spacer that is the opposite thickness of the new left side spacer. For example, if the left spacer was replaced with a 0.10 mm (0.004 in) thicker spacer, replace the right spacer with one that is 0.10 mm (0.004 in) thinner.

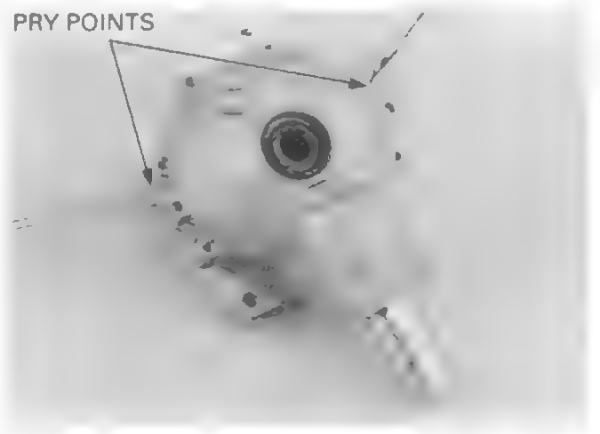


## DIFFERENTIAL CASE DISASSEMBLY ('98 – '01)

Remove the cover bolts in two or three steps in a crisscross pattern to prevent differential case warpage.



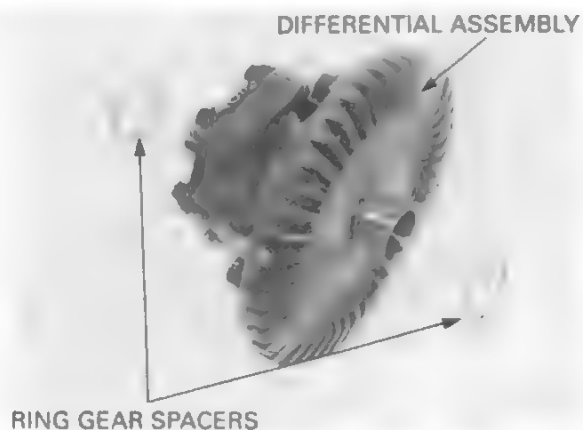
Carefully pry the cover off the case using a screwdriver at the pry points as shown.





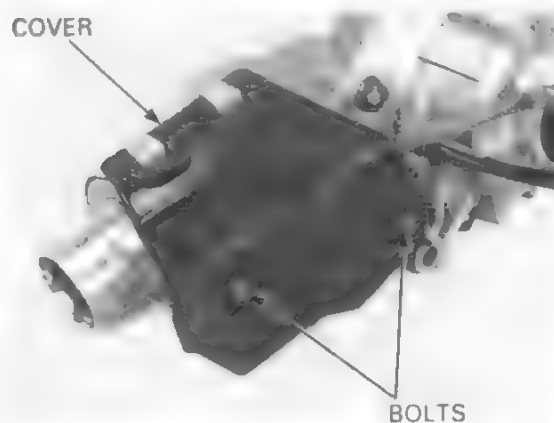
## FRONT DRIVING MECHANISM

Remove the differential assembly and the adjustment spacers from the differential case.

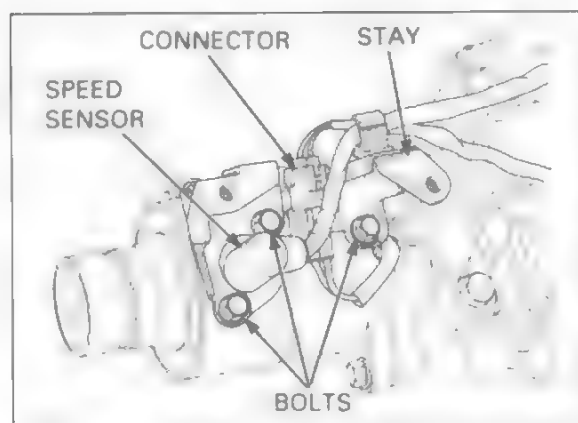


### DIFFERENTIAL CASE DISASSEMBLY (After '01)

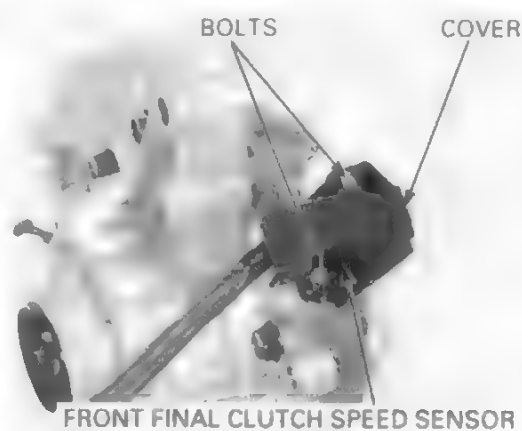
Remove the bolts and final clutch cover.



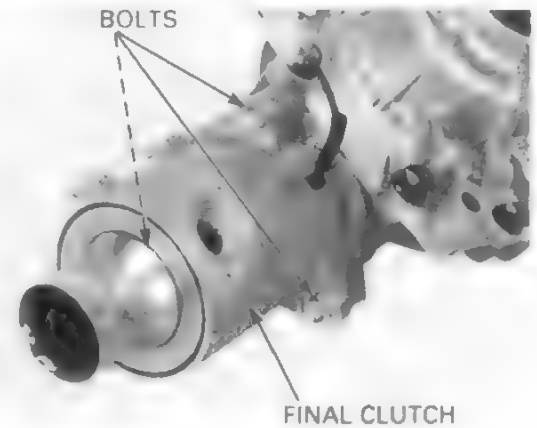
Disconnect the final clutch connector.  
Remove the bolts, stay and meter speed sensor.



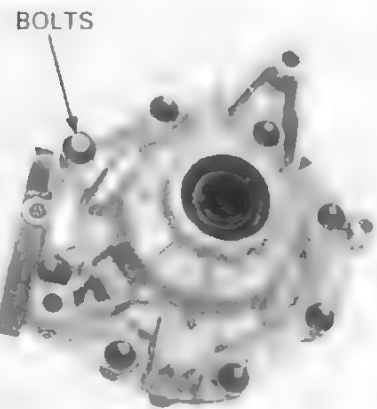
Remove the bolts, cover and front final clutch speed sensor.



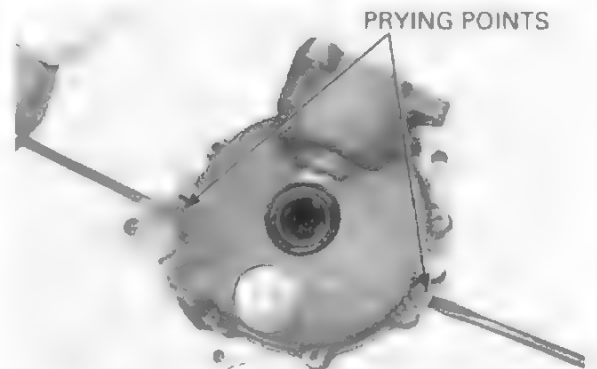
Remove the final clutch mounting bolts and final clutch.



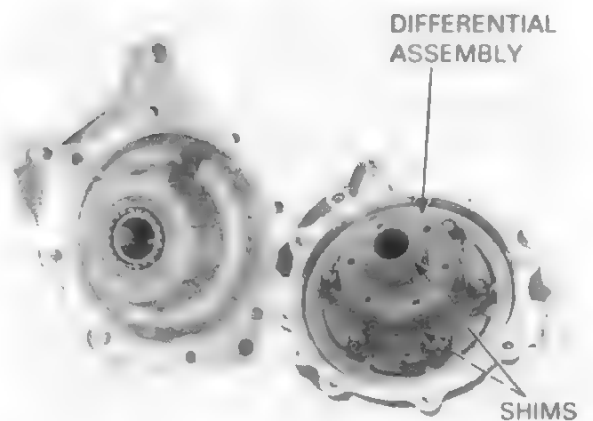
Remove the cover bolts in a crisscross pattern in several steps.



Pry the cover at the prying points using a screwdriver and remove the case cover.



Remove the differential assembly and shims.



### BEARING INSPECTION

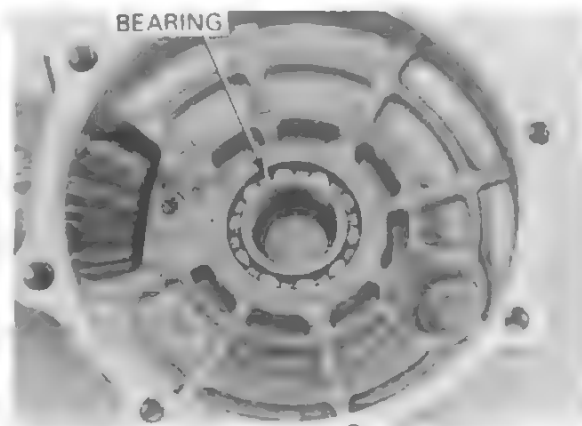
Turn the inner race of each ring gear bearing with your finger.

The bearings should turn smoothly and quietly. Also check that the outer race fits tightly in the case and cover.

Remove and discard the bearings if the races do not turn smoothly and quietly, or if they fit loosely in the case or cover.

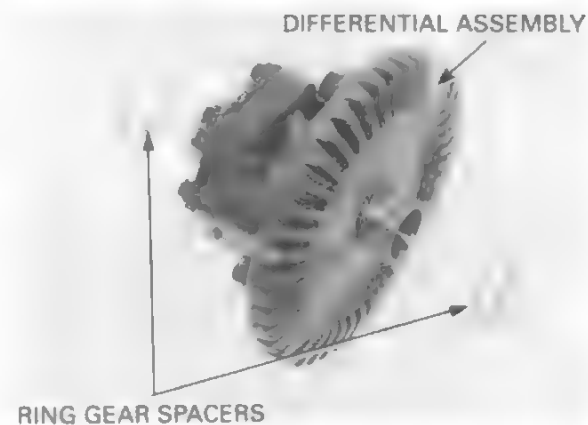
For ring gear bearing replacement, go to page 15-30.

For drive pinion removal and disassembly, go to page 15-27.



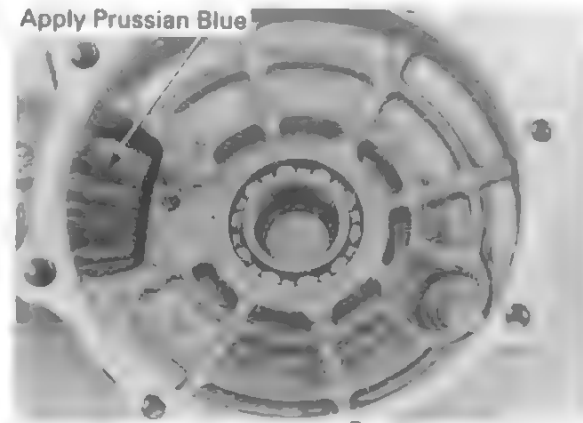
### GEAR TOOTH CONTACT PATTERN CHECK ('98 - '01)

Install the original ring gear spacers onto the differential assembly.



Apply a thin coat of Prussian Blue to the pinion gear teeth for a gear tooth contact pattern check.

Apply Prussian Blue



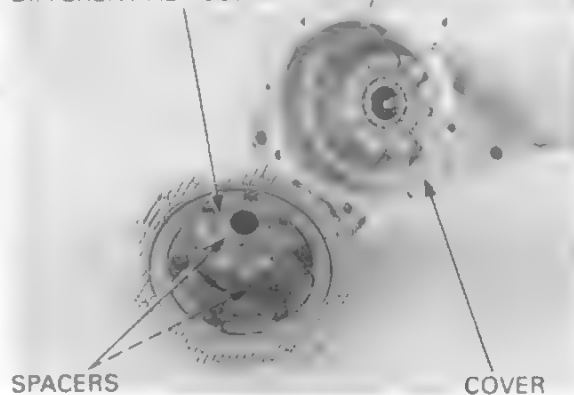
Clean all sealing material off the mating surfaces of the differential case and cover.

#### NOTE:

- Keep dust and dirt out of the differential case.
- Be careful not to damage the mating surface.

Install the differential assembly with the spacers into the differential case.

DIFFERENTIAL ASSEMBLY



Tighten the cover bolts in two or three steps until the cover evenly touches the gear case. Then, while rotating the drive pinion, tighten the bolts to the specified torque in two or three steps in a crisscross pattern.

## TORQUE:

10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)

8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)

## CAUTION:

*It is important to turn the pinion while tightening the bolts. If the ring gear spacer is too thick, the gears will lock after only light tightening*

Remove the oil filler cap from the differential case. Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

The pattern is indicated by the Prussian Blue applied to the pinion before assembly.

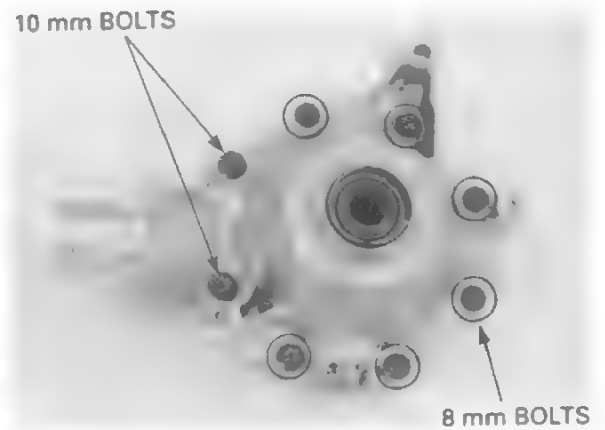
Contact is normal if the Prussian Blue is transferred to the approximate center but slightly to the heel side of each tooth and to the flank side.

If the patterns are not correct, remove and replace the pinion spacer with one of an alternate thickness. Replace the pinion spacer with a thicker one if the contact is too high, toward the face. Replace the pinion spacer with a thinner one if the contact is too low, to the flank side. The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the spacer is changed by 0.12 mm (0.005 in).

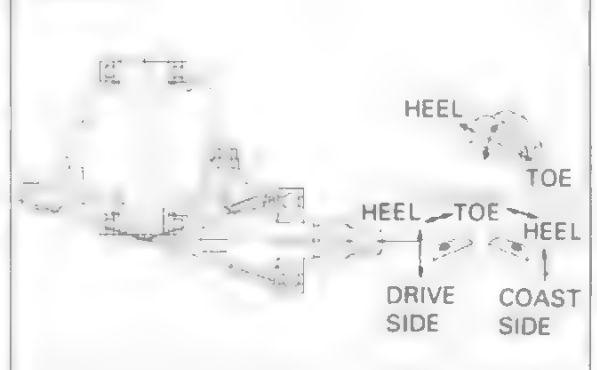
## PINION SPACERS:

L: 1.64 mm (0.064 in)	C: 1.94 mm (0.076 in)
M: 1.70 mm (0.067 in)	D: 2.00 mm (0.079 in)
N: 1.76 mm (0.069 in)	E: 2.06 mm (0.081 in)
A: 1.82 mm (0.072 in)	F: 2.12 mm (0.083 in)
B: 1.88 mm (0.074 in)	G: 2.18 mm (0.086 in)

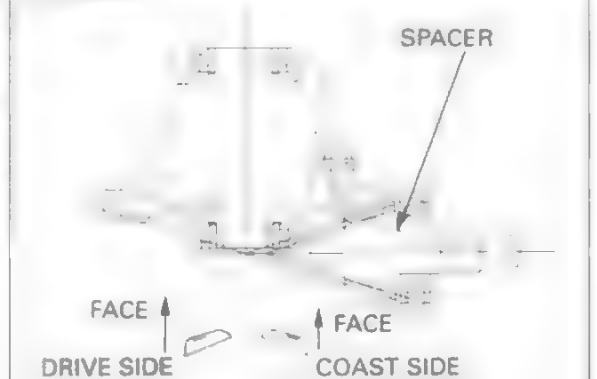
For pinion spacer replacement, go to page 15-27.



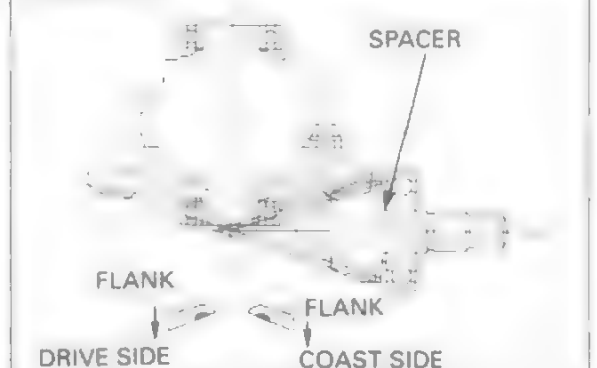
## NORMAL:



## TOO HIGH:



## TOO LOW:



## GEAR TOOTH CONTACT PATTERN CHECK (After '01)

Install the final clutch and tighten the final clutch mounting bolts.

**TORQUE: 25 N·m (2.6 kgf·m, 19 lbf·ft)**

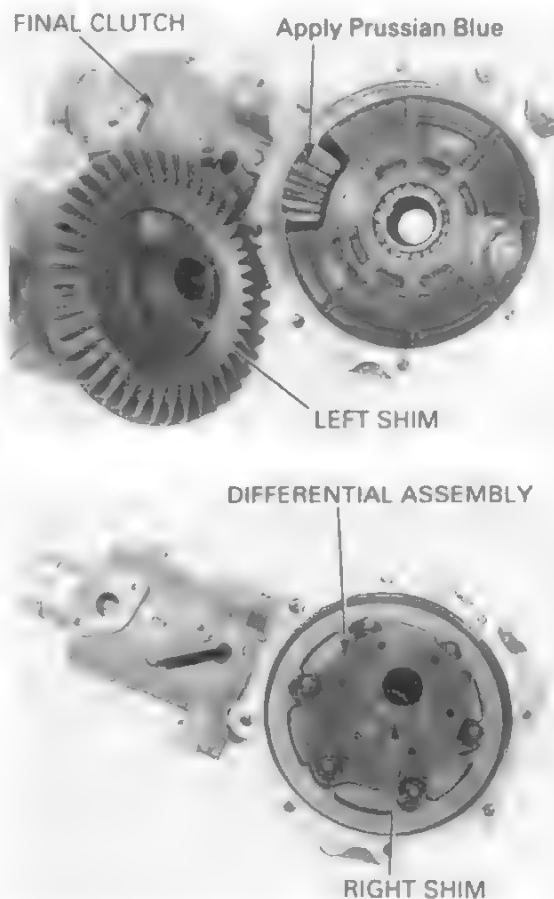
*Keep dust and dirt out of the case and cover.*

Clean sealing material off the mating surfaces of the differential case and cover, being careful not to damage them.

Apply a thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims onto the differential assembly.

Install the differential assembly into the gear case.

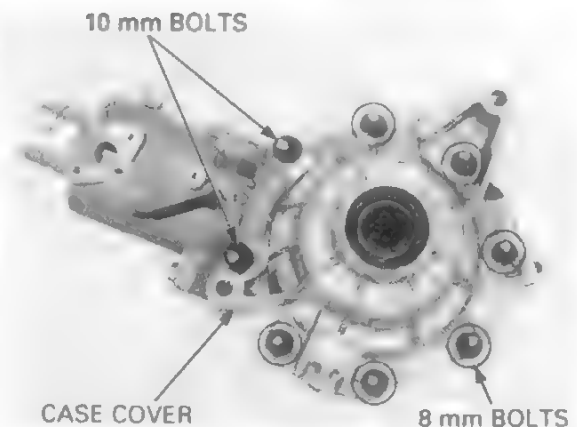


*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.*

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

**TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)**

**8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)**



Remove the oil filler cap.

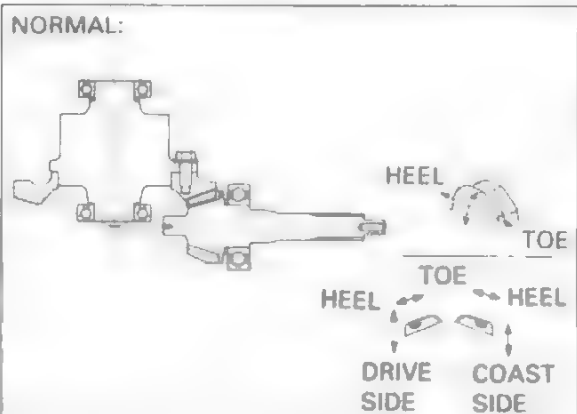
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filter hole.

The pattern is indicated by the Prussian Blue applied to the pinion.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.



Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

Replace the pinion shim with a thinner one if the contact pattern is too low, toward the flank.

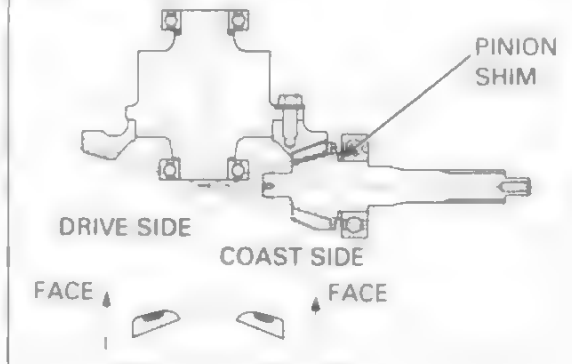
The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

**Pinion shims:**

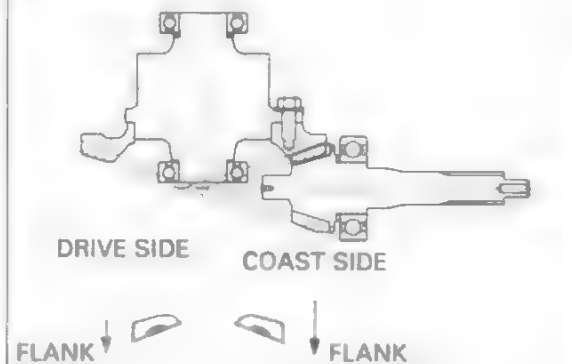
<b>A:</b> 1.64 mm (0.064 in)	<b>I:</b> 2.12 mm (0.083 in)
<b>B:</b> 1.70 mm (0.067 in)	<b>J:</b> 2.18 mm (0.086 in)
<b>C:</b> 1.76 mm (0.069 in)	<b>K:</b> 2.24 mm (0.088 in)
<b>D:</b> 1.82 mm (0.072 in)	<b>L:</b> 2.30 mm (0.091 in)
<b>E:</b> 1.88 mm (0.074 in)	<b>M:</b> 2.36 mm (0.093 in)
<b>F:</b> 1.94 mm (0.076 in)	<b>N:</b> 2.42 mm (0.095 in)
<b>G:</b> 2.00 mm (0.079 in)	<b>O:</b> 2.48 mm (0.098 in)
<b>H:</b> 2.06 mm (0.081 in)	

For pinion shim replacement, see page 15-27.

**TOO HIGH:**



**TOO LOW:**



**DIFFERENTIAL ASSEMBLY INSPECTION ('98 – '01)**

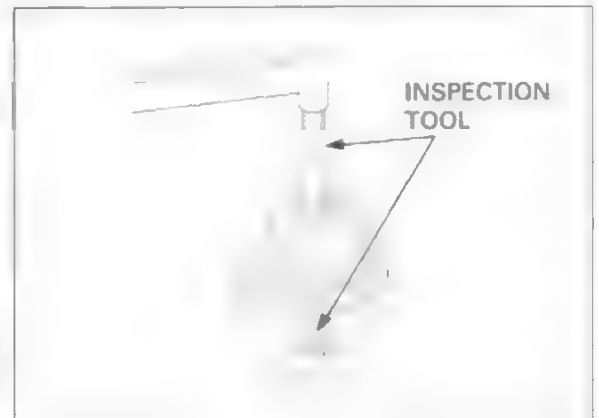
Inspect function:

Install the differential inspection tools to both sides of the differential.

**TOOL:**

**Differential inspection tool** 07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)

Hold the chamfered side with a bench vise as shown. Place a torque wrench on the other tool and measure the limited slip torque, using the special tool.



**SLIP TORQUE:**

17 – 25 N·m (1.7 – 2.5 kgf·m, 12 – 18 lbf·ft)

If the limited slip differential will be disassembled or if the slip torque is out of specification, perform the following:

**NOTE:**

- A visual inspection must be done for each clutch pack (plate, discs, springs and seat).
- Always install each clutch pack assembly in its original location in the differential.
- Do not interchange components between the two clutch pack assemblies.

Remove both differential caps and clutch pack assemblies (page 15-23).

Inspect the clutch pack assemblies (page 15-24).

Then, install one of the differential caps onto its clutch pack assembly.

Check the slip torque on the reassembled clutch pack using the procedure specified above.

If the slip torque is out of specification, the clutch spring seat is worn.

Remove the inspection tools.

Remove the differential cap and the clutch pack from the differential.

Select a clutch spring seat of the required thickness.

If the slip torque is below specification, replace the spring seat with a thicker one.

If the slip torque is above specification, replace the spring seat with a thinner one.

Select the clutch spring seat from the list below.

**A: 1.0 mm (0.039 in)**

**B: 1.2 mm (0.047 in)**

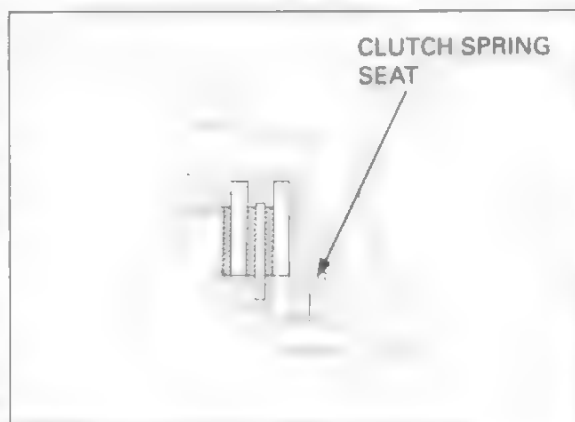
**C: 1.4 mm (0.055 in)**

**D: 1.6 mm (0.063 in)**

**E: 1.8 mm (0.071 in)**

Recheck the slip torque.

Next, inspect the remaining clutch pack assembly in the same way.



### DIFFERENTIAL INSPECTION (After '01)

Install the inspection tools into both sides of the differential.

#### TOOL:

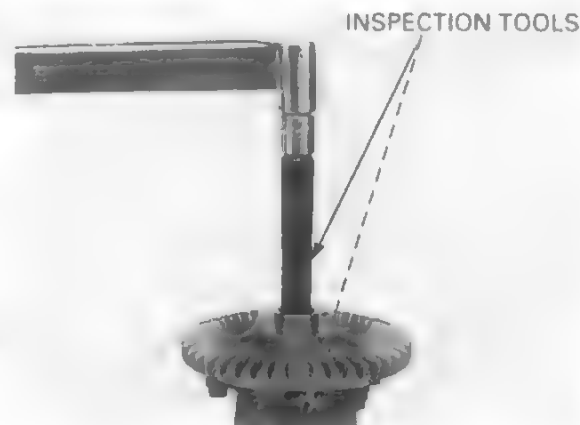
Differential inspection tool 07KMK-HC50101 or  
07KMK-HC5010A  
(U.S.A. only)

Hold the flat surface of the tool with a bench vise.  
Attach a torque wrench to the other tool and  
measure the limited slip torque.

**STANDARD: 14 – 17 N·m (1.45 – 1.75 kgf·m,  
10 – 13 lbf·ft)**

**SERVICE LIMIT: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

If the slip torque is out of specification, disassemble the differential and perform the components inspection (page 15-26) since the differential may be faulty.

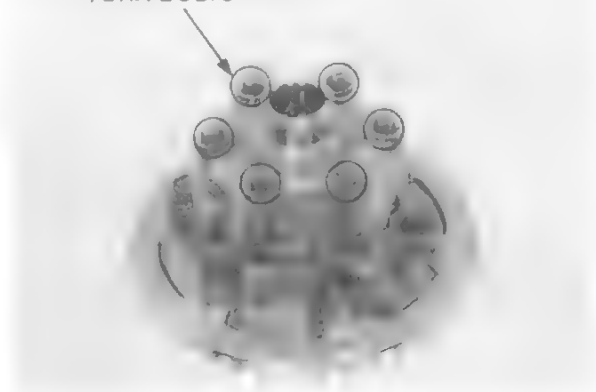


## DIFFERENTIAL DISASSEMBLY ( '98 - '01 )

Remove the following:

- Torx bolts

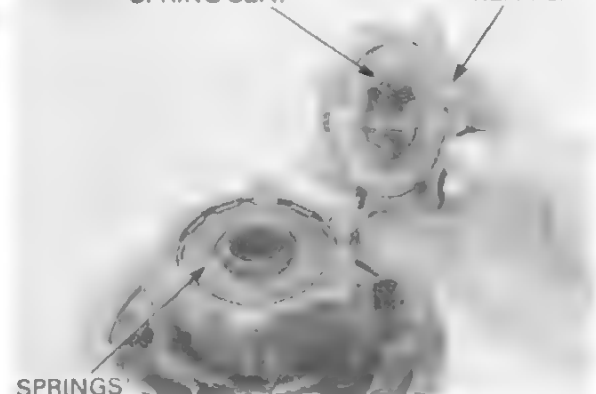
TORX BOLTS



- Differential case rear cap
- Clutch pack (spring seat, springs, discs and plate)
- Side gear
- Washer

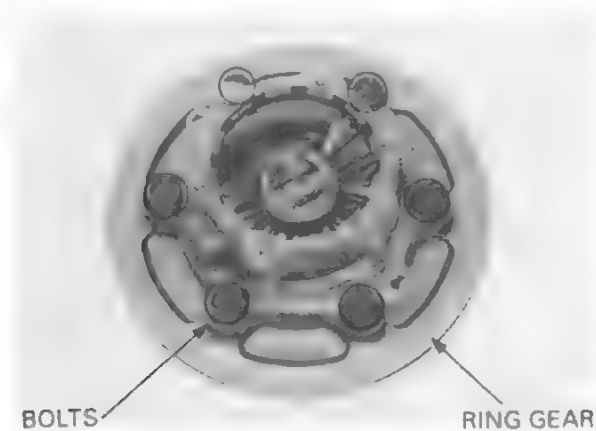
SPRING SEAT

REAR CAP



SPRINGS

- Bolts
- Ring gear

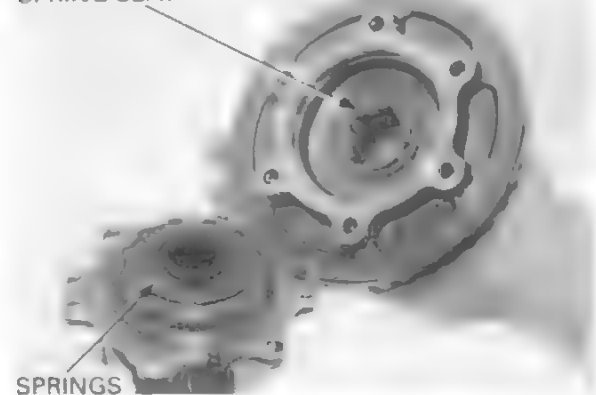


BOLTS

RING GEAR

- Clutch pack (spring seat, springs, discs and plate)
- Side gear
- Washer

SPRING SEAT

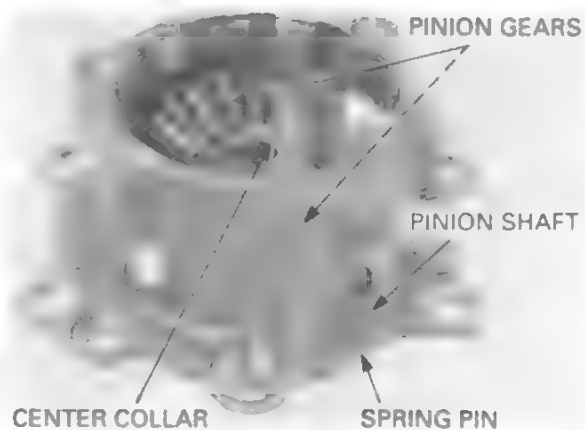


SPRINGS



## FRONT DRIVING MECHANISM

- Spring pin
- Pinion shaft
- Pinion gears
- Center collar
- Side washers



### DIFFERENTIAL INSPECTION

#### CLUTCH

Measure and record the height of the clutch spring.

**SERVICE LIMIT: 2.5 mm (0.10 mm)**



Check the clutch discs for scoring or discoloration.  
Measure the thickness of each disc.

#### SERVICE LIMITS:

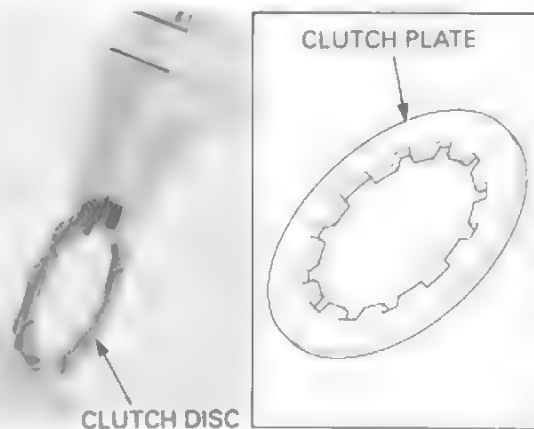
**DISC A: 2.4 mm (0.09 in)**

**DISC B: 2.1 mm (0.08 in)**

#### NOTE:

Clutch disc B has two faces: one side is a steel plate, the other side is a friction surface disc.

Inspect the clutch plate surface for excessive scores or discoloration (Purple) and replace if necessary.



#### PINION

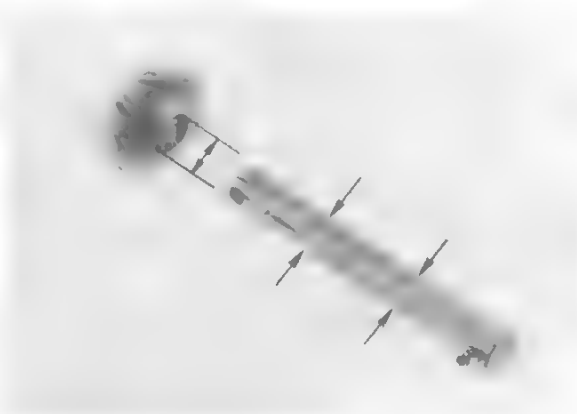
Measure the pinion gear I.D. and pinion shaft O.D.

#### SERVICE LIMITS:

**PINION GEAR I.D.: 12.05 mm (0.474 in)**

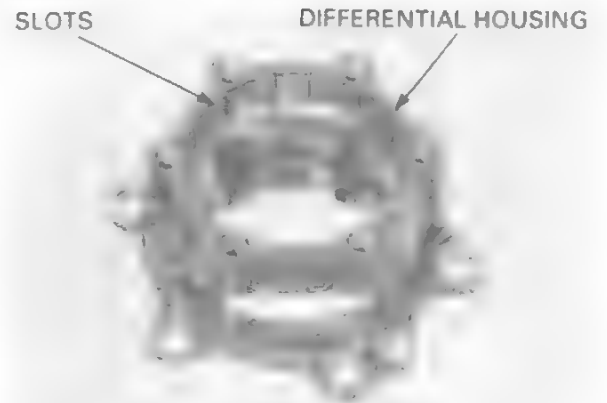
**PINION SHAFT O.D.: 11.75 mm (0.463 in)**

Check the side washer for wear or damage.



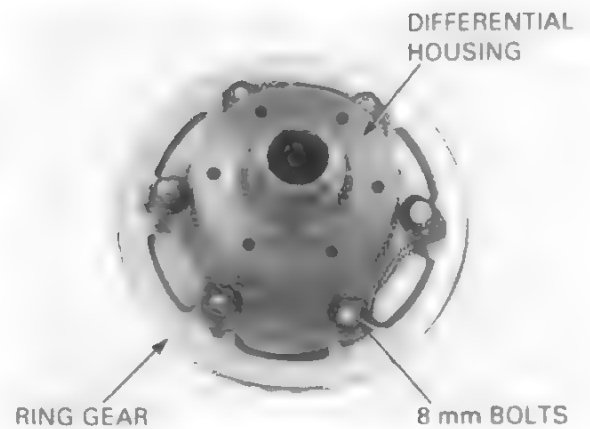
## DIFFERENTIAL HOUSING

Check the slots for wear or damage.



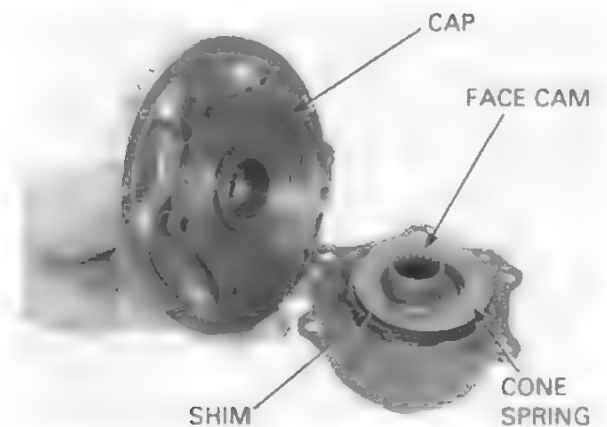
## DIFFERENTIAL DISASSEMBLY (After '01)

Remove the six bolts, then place the differential assembly with the housing side down, and remove the ring gear.

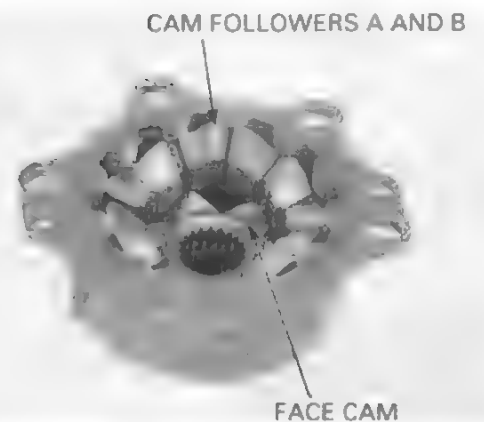


Remove the following

- differential cap
- cone spring
- shim



- left face cam
- six cam followers A and six cam followers B
- right face cam



## FRONT DRIVING MECHANISM

*If the differential housing, cap and face cam are faulty, replace the differential as an assembly.*

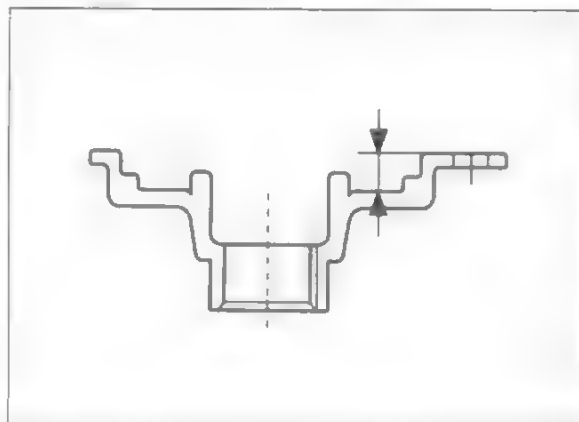
### DIFFERENTIAL COMPONENTS INSPECTION (After '01)

#### DIFFERENTIAL CAP

Check the sliding surface of the cap for damage or discoloration.

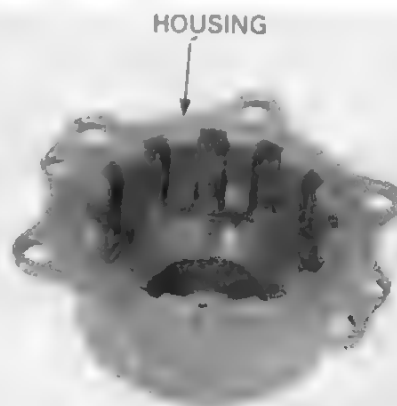
Measure the depth of the cap from the mating surface as shown.

**SERVICE LIMIT: 9.55 mm (0.376 in)**



#### DIFFERENTIAL HOUSING/FACE CAM/CAM FOLLOWER

Check the sliding surface and grooves of the housing for damage or discoloration.



*Replace the cam followers as a set (12 pieces)*

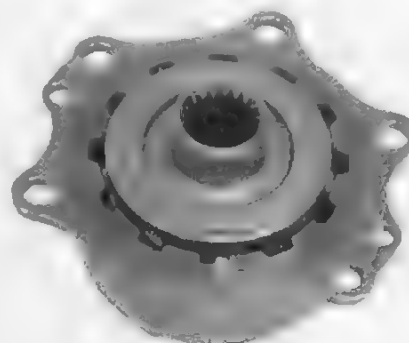
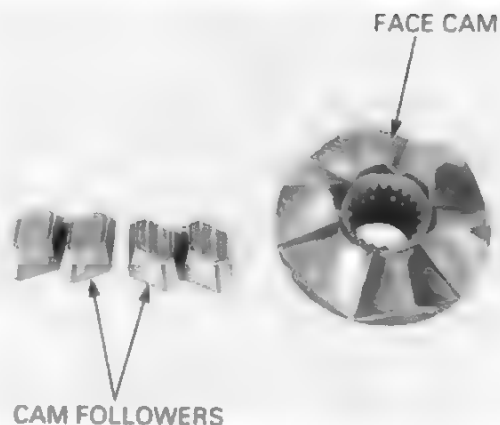
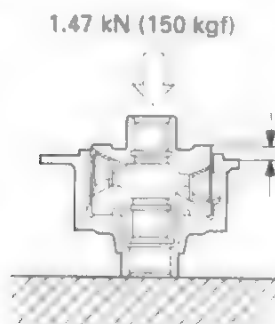
Check the shim, face cams and followers for damage.

Temporarily assemble the differential housing, face cams and cam followers (page 15-38).

Measure the height of the face cam from the housing mating surface as shown while applying a load of 1.47 kN (150 kgf) to the face cam boss using a hydraulic press

**SERVICE LIMIT: 6.3 mm (0.25 in)**

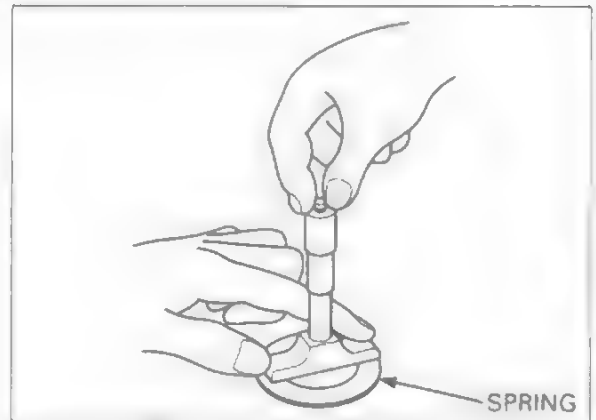
If the height exceeds the limit, replace the differential as an assembly.



## SIDE CONE SPRING

Check the spring for damage.  
Measure the height of the cone spring.

**SERVICE LIMIT:** 2.6 mm (0.10 in)



## DRIVE PINION REMOVAL ('98 - '01)

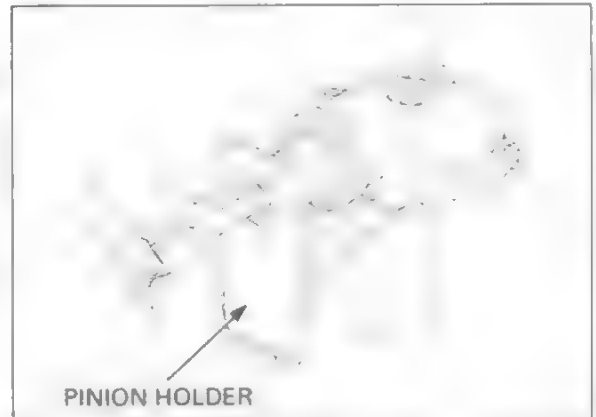
Install the pinion holder on the pinion joint and secure in a vise as shown.

### TOOL:

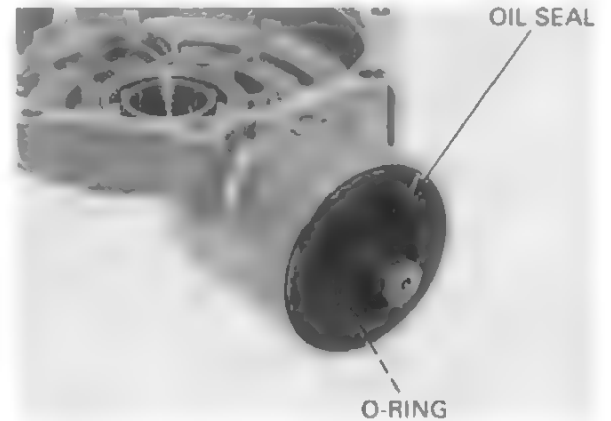
**Pinion holder**

**07SMB-HM70200**

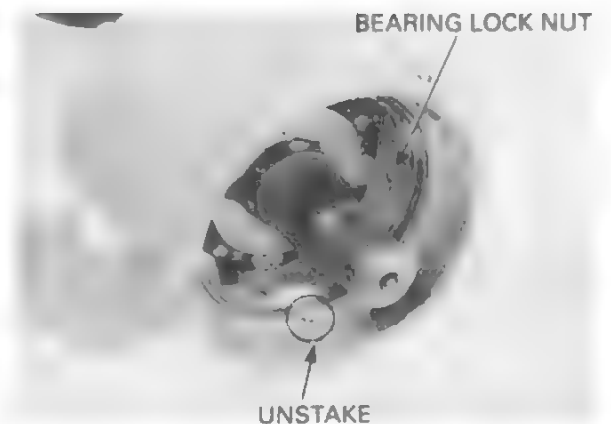
Remove the pinion joint nut, then remove the pinion holder and pinion joint.



Remove the oil seal and O-ring.



Unstake the pinion bearing lock nut with a drill or grinder.  
Be careful that metal particles do not enter the bearing and that the threads are not damaged.

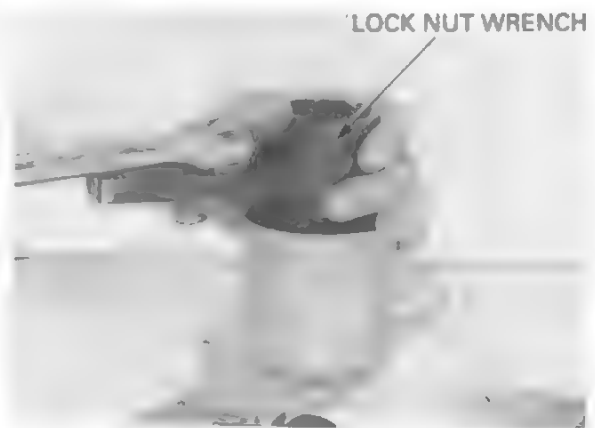


## FRONT DRIVING MECHANISM

Remove the pinion bearing lock nut with the lock nut wrench.

**TOOL:**

Lock nut wrench, 30 X 64 mm 07916-MB00002 or  
07916-MB00001



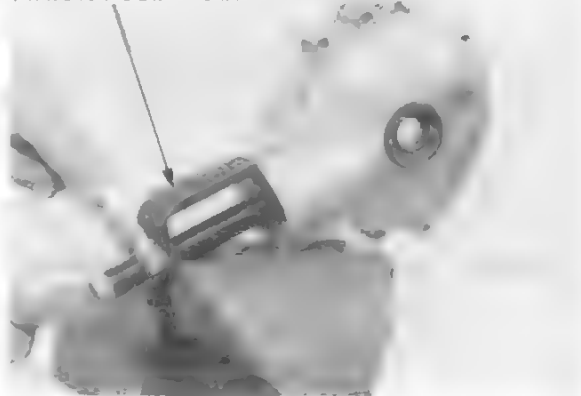
Install the pinion puller attachment tool onto the differential case.

Screw the shaft puller onto the threads of the drive pinion.

Turn the 23 mm special nut counterclockwise with a 23 mm wrench while holding the shaft with a 17 mm wrench to remove the drive pinion from its housing.

Remove the drive pinion assembly using the special tools.

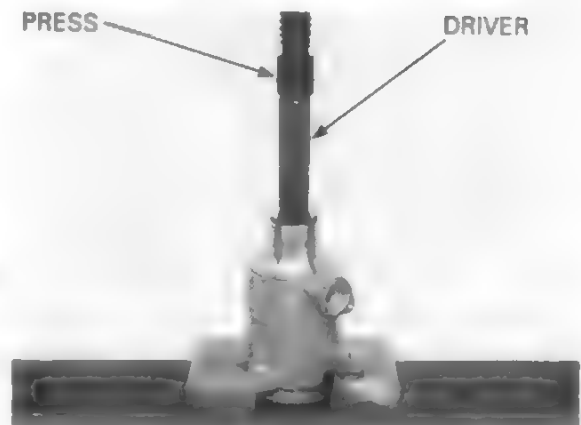
**PINION PULLER SET**



**TOOLS:**

Pinion puller set	07HMC-MM80101
- Shaft puller	07931-ME40000
- Pinion puller base	07HMC-MM80110
or U.S.A. only:	
Shaft puller	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base "A"	07HMC-MM8011A

PRESS DRIVER



### DRIVE PINION REMOVAL (After '01)

Press the drive pinion out from the final clutch using the special tools.

**TOOL:**

Driver	07749-0010000
Pilot, 15 mm	07746-0040300

Heat the final clutch to 100°C (212 °F).

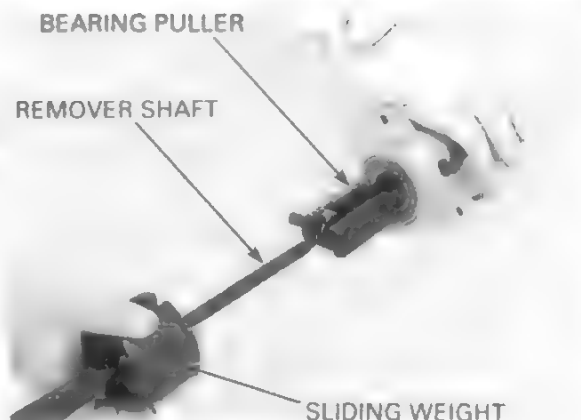


*To avoid burns, wear heavy gloves when handling the heated final clutch.*

Remove the drive pinion bearing from the final clutch using the special tools.

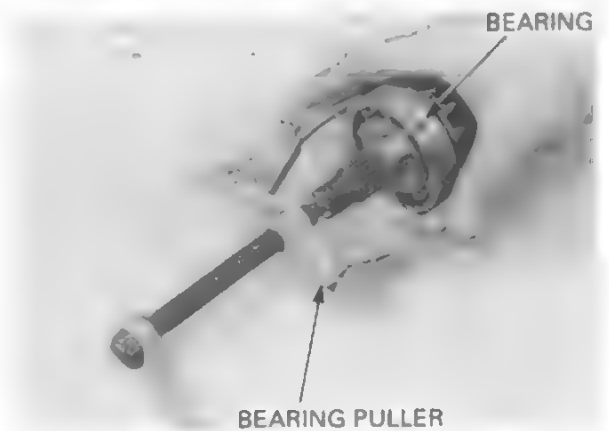
**TOOL:**

Adjustable bearing puller	07JAC-PH80101
Remover shaft	07JAC-PH80200
Sliding weight	07741-0010201



## DRIVE PINION DISASSEMBLY/ ASSEMBLY ('98 - '01)

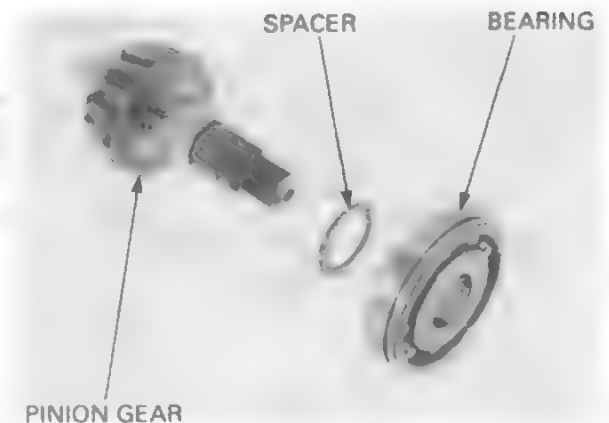
Pull the bearing off the shaft with a commercially available bearing puller.  
Remove the pinion adjustment spacer.



To reassemble, first install the pinion spacer.

### NOTE:

When the gear set, pinion bearing and/or differential case has been replaced, use a 2.0 mm (0.08 in) thick spacer.

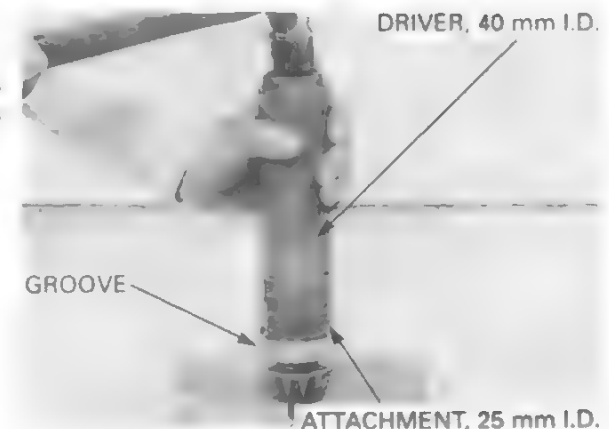


Apply #80 gear oil to the bearing.

Drive the bearing onto the drive pinion with its groove side facing out using the special tools as shown.

### TOOLS:

Driver, 40 mm I.D.	07746-0030100
Attachment, 25 mm I.D.	07746-0030200

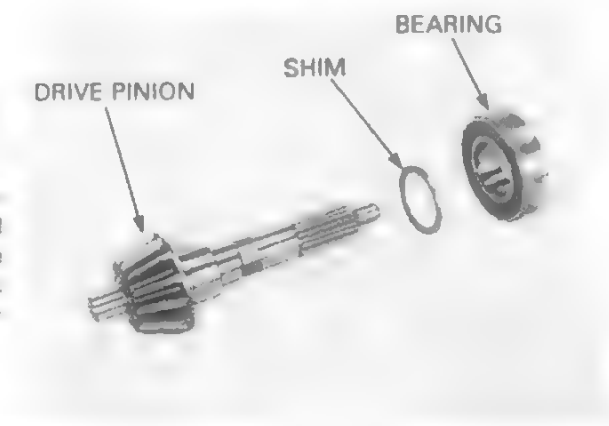


## DRIVE PINION INSTALLATION (After '01)

Install the shim and bearing onto the drive pinion.

### NOTE:

- When the gear set, ring gear bearing, differential housing and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.



## FRONT DRIVING MECHANISM

Press the drive pinion bearing into the drive pinion.

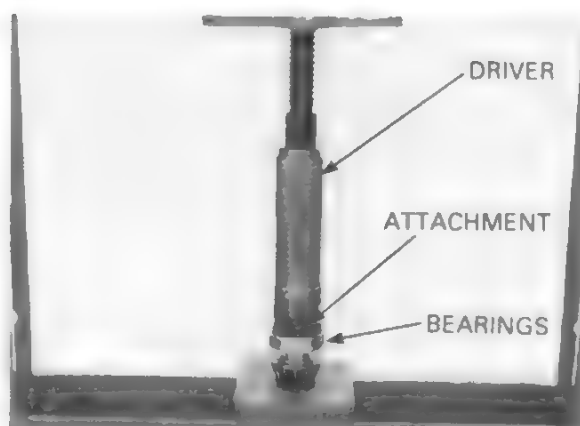
### TOOLS:

Driver, 40 mm I.D.

07746-0030100

Attachment, 30 mm I.D.

07746-0030300



Press the drive pinion assembly into the final clutch.

### TOOLS:

Oil seal driver

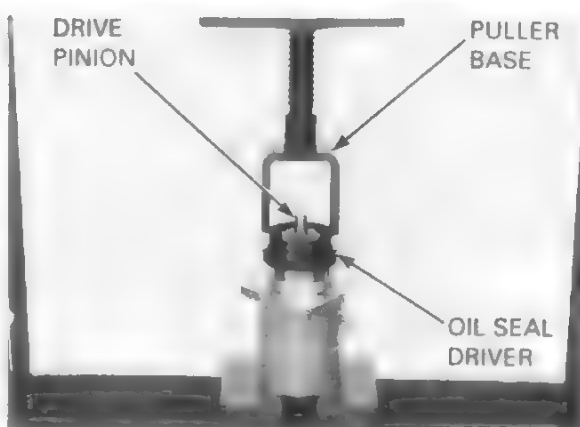
07965-KE80100

Puller base

07HMC-MM80110

### CAUTION

*Do not damage the oil seal lips.*

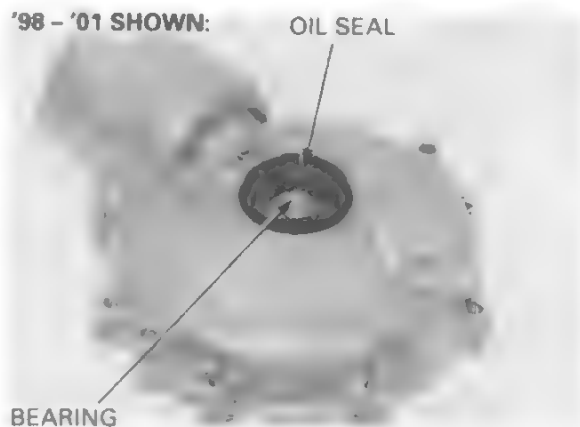


## CASE BEARING REPLACEMENT

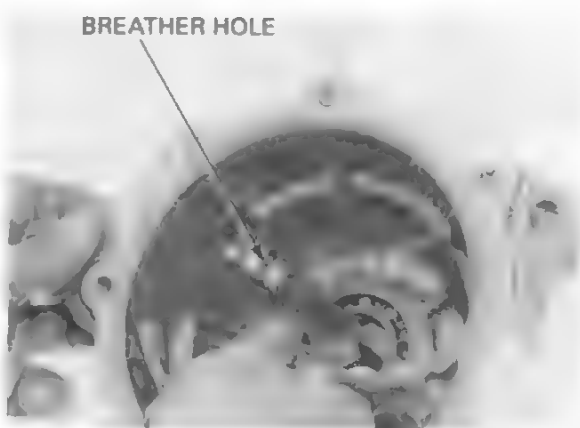
Remove the oil seal.

Drive the ring gear bearing out of the case and cover.

'98 - '01 SHOWN:



Blow compressed air through the breather hole in the differential cover.

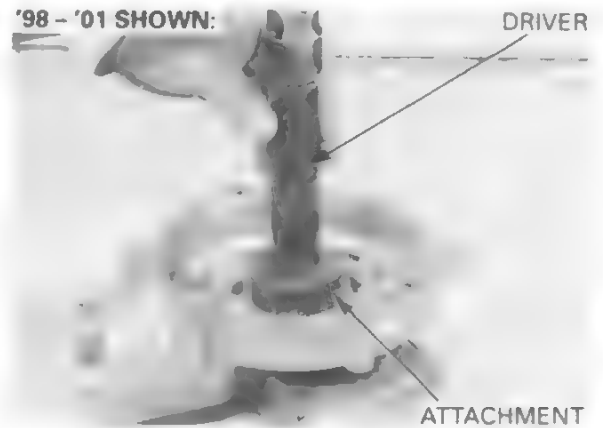


Drive the ring gear bearing into the case and cover using the special tools.

## TOOLS:

Driver	07749-0010000
Attachment, 52 X 55 mm	07746-0010400
Pilot, 28 mm (After '01)	07746-0041100

'98 - '01 SHOWN:



Install new oil seals in the case and cover using the special tools

## TOOL (After '01):

Driver	07749-0010000
Attachment, 52 X 55 mm	07746-0010400

Apply grease to the oil seal lips.



## PINION NEEDLE BEARING REPLACEMENT

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole. Bend up the end of the ring with a screwdriver. Grasp the end of the ring with needle-nosed pliers and pull the stopper ring out through the access hole.

Heat the gear case to 80°C (176°F) and remove the pinion needle bearing by using the special tool.

## TOOLS:

Bearing remover, 14 mm	07WMC-KFG0100
Remover shaft, 15 mm	07936-KC10100
Remover weight	07741-0010201
USA only:	
Bearing remover, 15 mm	07936-KC10200
Remover shaft, 14 mm	07YMC-001010A
Remover weight	07936-371020A or 07936-3710200
Remove handle	07936-3710100

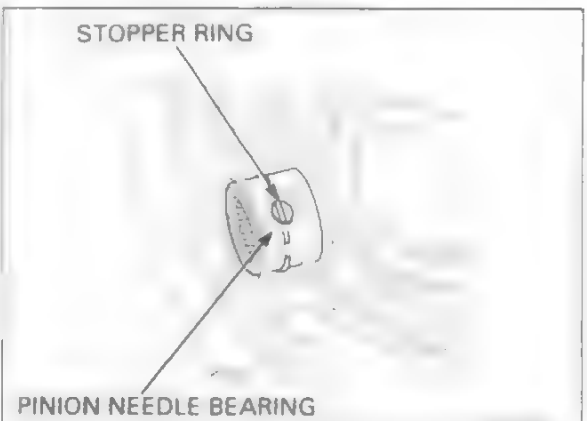
## WARNING

**Be sure to wear heavy gloves to avoid burns when handling the heated gear case.**

Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

## CAUTION:

**Using a torch to heat the gear case may cause warpage.**





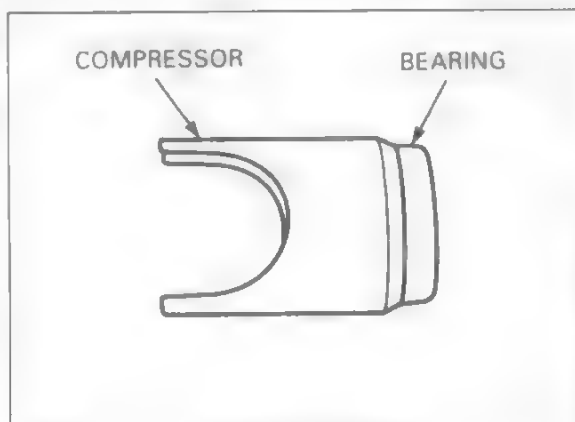
## FRONT DRIVING MECHANISM

Install the stopper ring into the groove in the bearing. Install the bearing into the compressor until the bearing is flush with the end of the tool. Place the driver on top of the bearing and tape the driver to the compressor. Place the assembly into a freezer for at least 30 minutes.

### TOOLS:

**Driver** 07749-0010000  
**Differential bearing ring compressor** 07YME-HN4010A

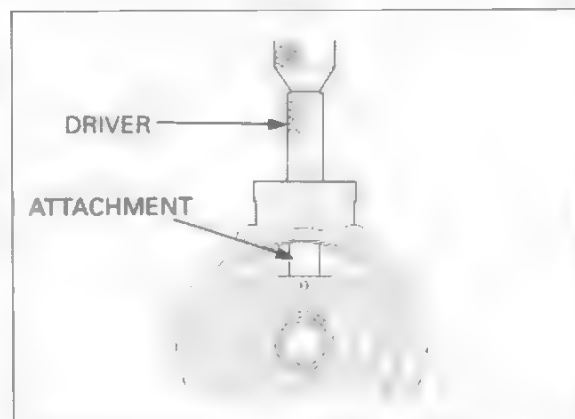
'98 - '01: **Attachment, 24 × 26 mm** 07746-0010700  
After '01: **Attachment, 22 × 24 mm** 07746-0010800  
After '01: **Pilot, 14 mm** 07746-0041200



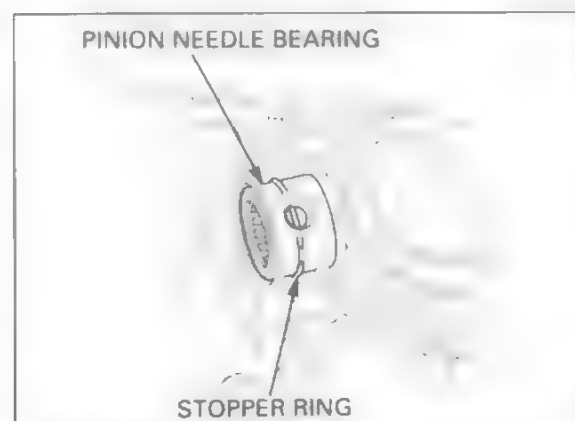
Heat the gear case to 80°C (176°F).

Remove the needle bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new one.



Make sure that the stopper ring is securely set in the groove of the gear case.



### DRIVE PINION INSTALLATION ('98 - '01)

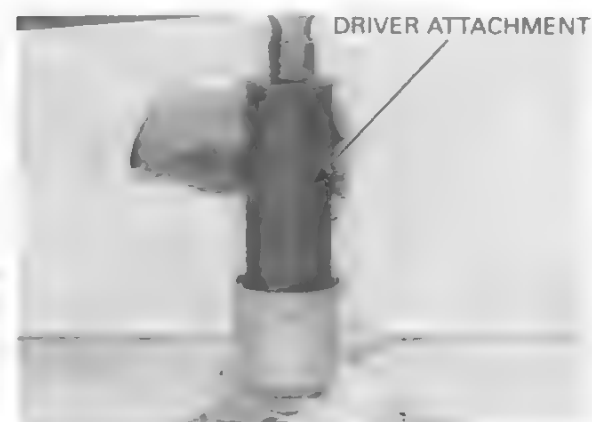
Place the drive pinion assembly into its housing and drive it into the differential case.

### TOOL:

**Driver attachment** 07965-KE80200 or 07947-KA50100

### NOTE:

Keep the driver centered with the bearing outer race during installation.



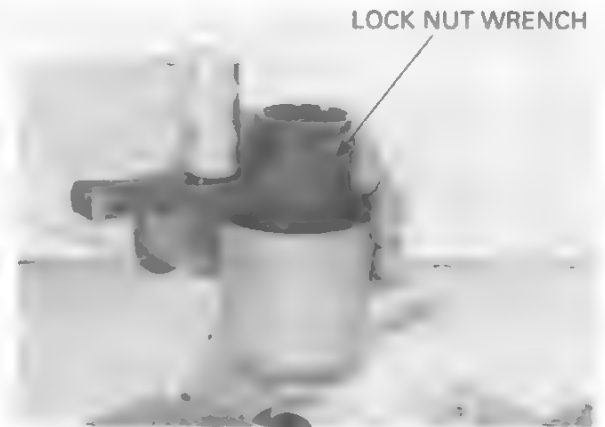
Install and tighten the new pinion bearing lock nut.

**TORQUE:** 98 N·m (10.0 kgf·m, 72 lbf·ft)

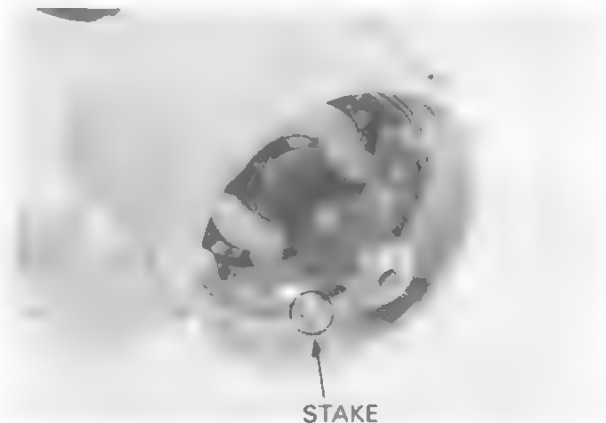
**Wrench scale reading:** 89 N·m (9.1 kgf·m, 66 lbf·ft)  
using a 50 cm (20 in) long torque wrench

**TOOL:**

Lock nut wrench, 30 × 64 mm 07916-MB00002 or  
07916-MB00001

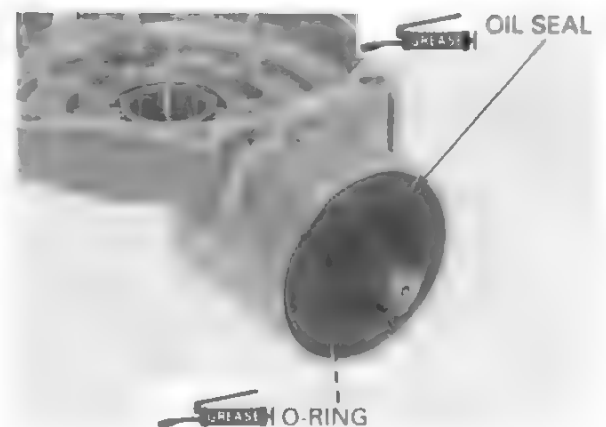


Stake the pinion bearing lock nut.



Apply grease and install the O-ring onto the pinion shaft.

Apply grease to the new drive pinion oil seal lips.  
Install the new drive pinion oil seal on the case.



Apply a locking agent to the pinion threads.  
Install the pinion joint and joint nut.

Attach the pinion holder on the pinion joint and  
secure in a vise.

Tighten the pinion joint nut to the specified torque.

**TOOL:**

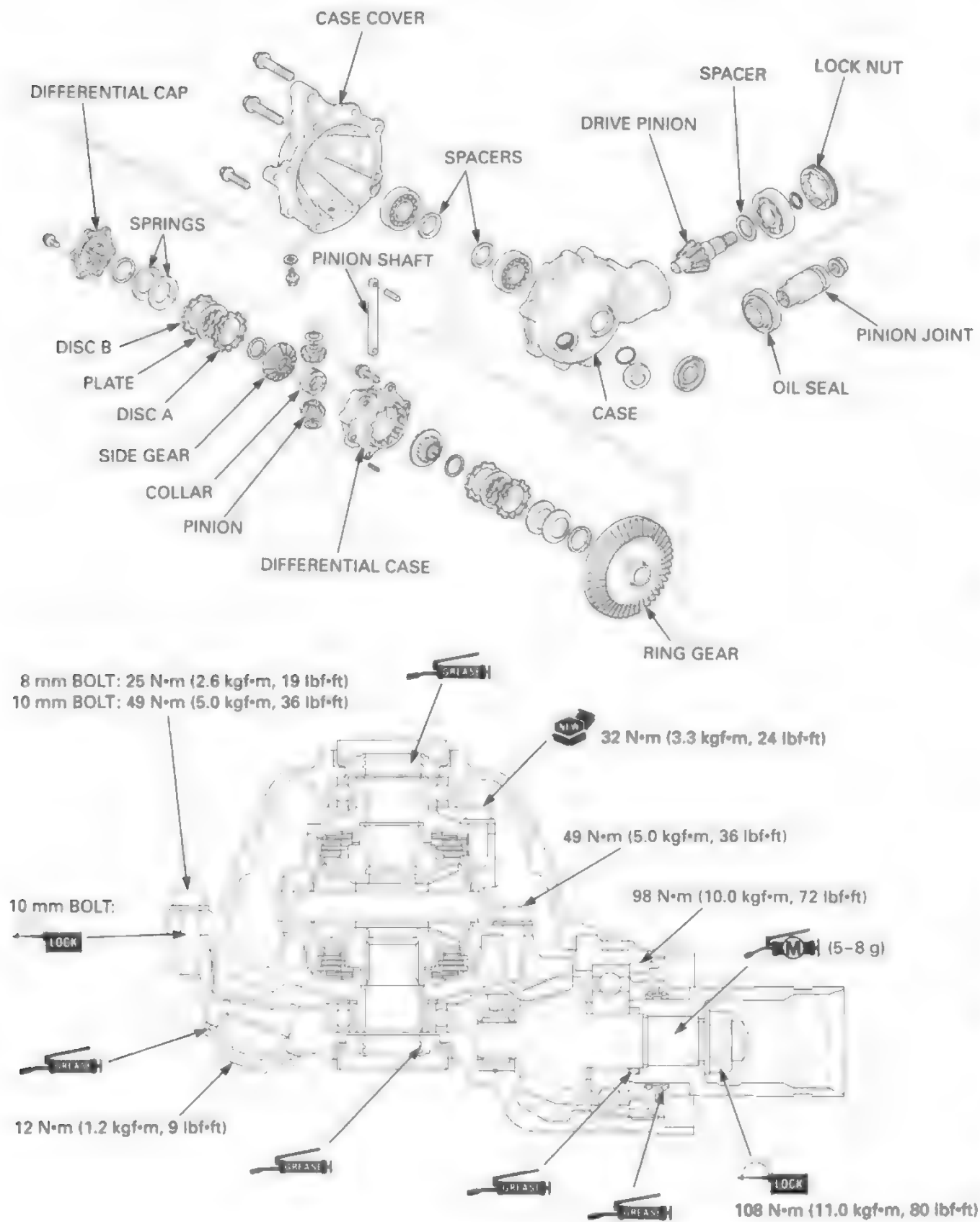
Pinion holder 07SMB-HM70200

**TORQUE:** 108 N·m (11.0 kgf·m, 80 lbf·ft)

Remove the pinion holder.



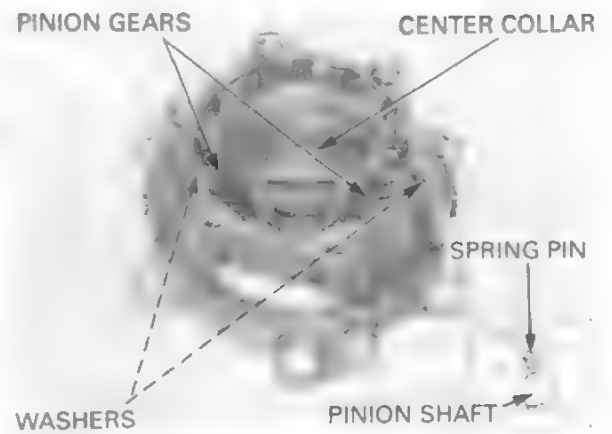
## DIFFERENTIAL ASSEMBLY ('98 - '01)



Install a new spring pin into the pinion shaft.

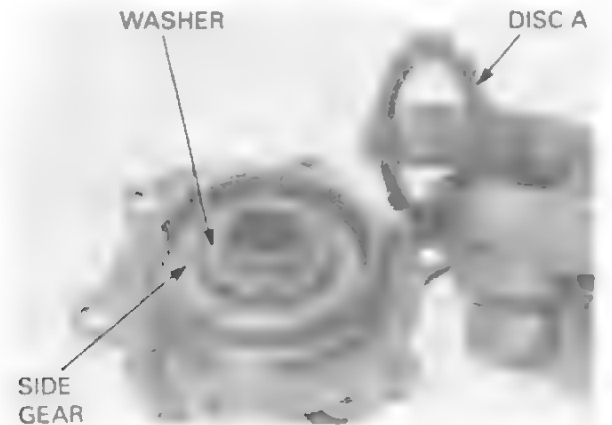
Install the washer, pinion gears and center collar into the housing.

Insert the pinion shaft and install a new spring pin securely.



Install the following:

- Side gear
- Washer
- Clutch disc A

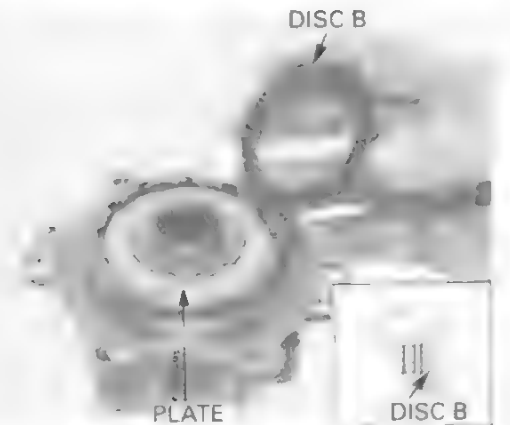


Install the following:

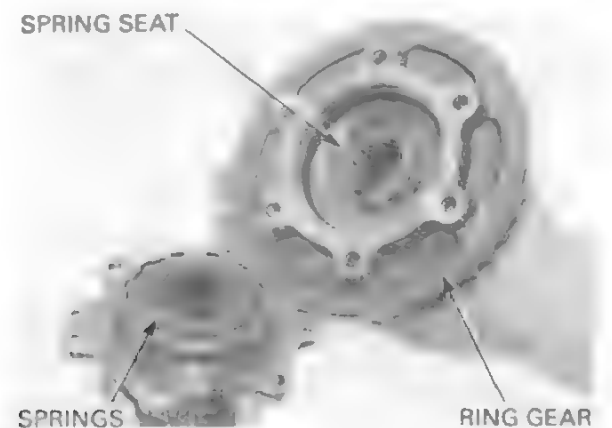
- Clutch plate
- Clutch disc B

NOTE:

Install the clutch disc B with the friction surface lining facing inside.

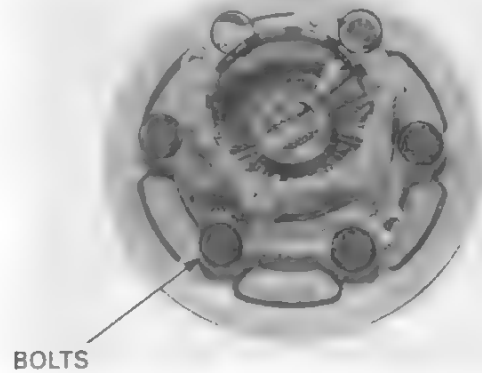


- Clutch springs
- Spring seat
- Ring gear



## FRONT DRIVING MECHANISM

Loosely install the bolts.



Install the outer clutch pack in the same manner.

Install the front differential cap.

Temporarily install the drive shaft to center the side gear, and differential cap.

Install the new torx bolts.

Tighten the bolts to the specified torque.

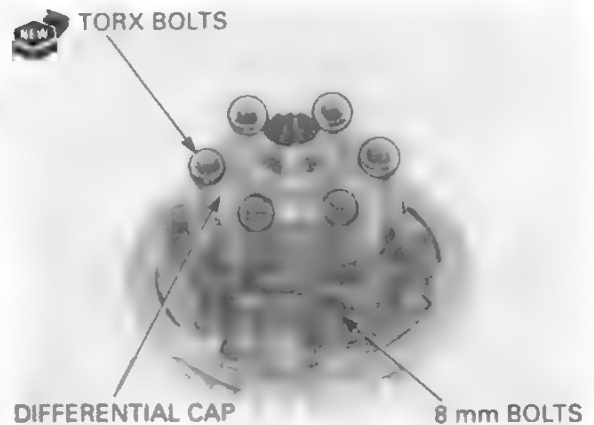
### TORQUE:

Torx bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)

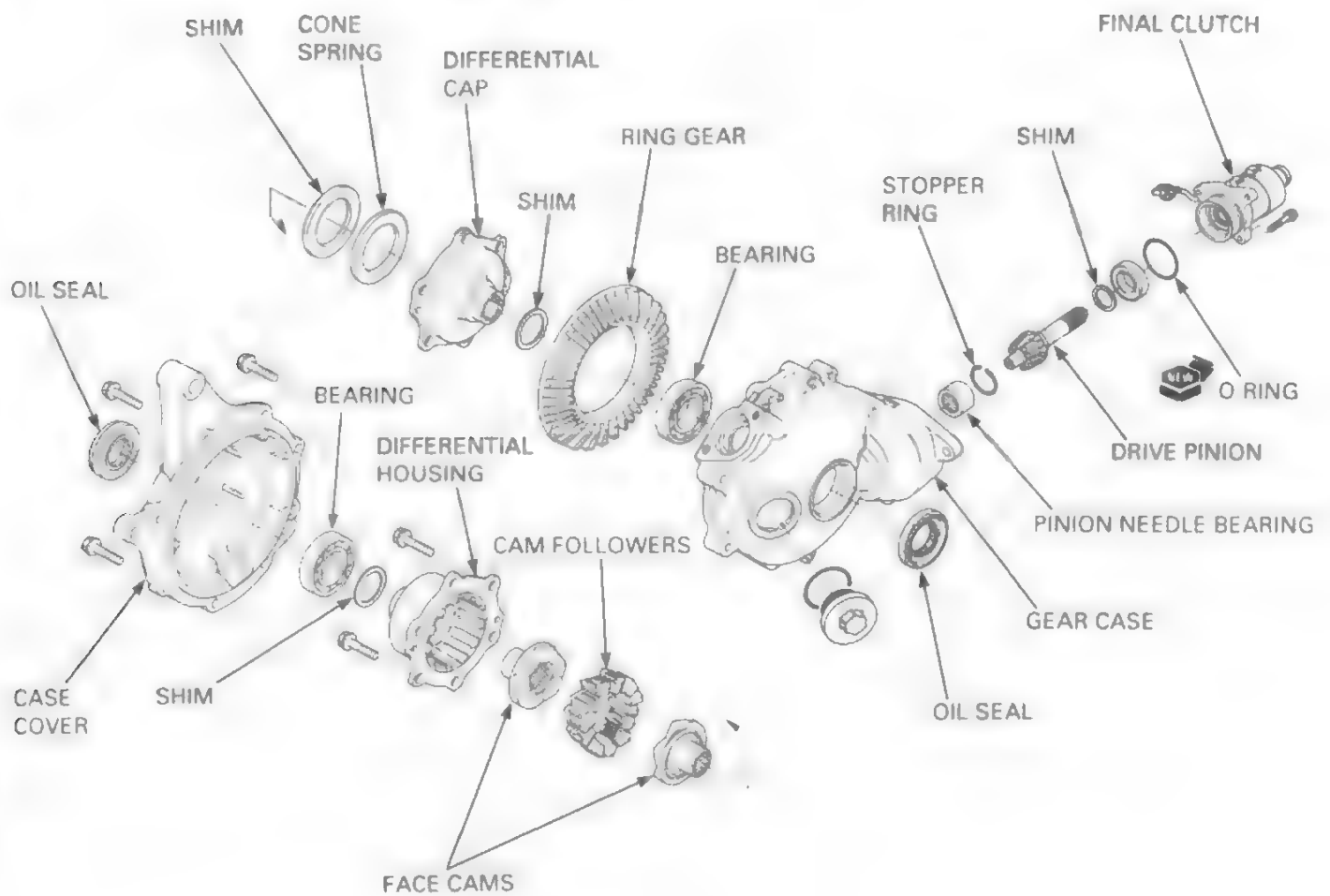
8 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)

### NOTE:

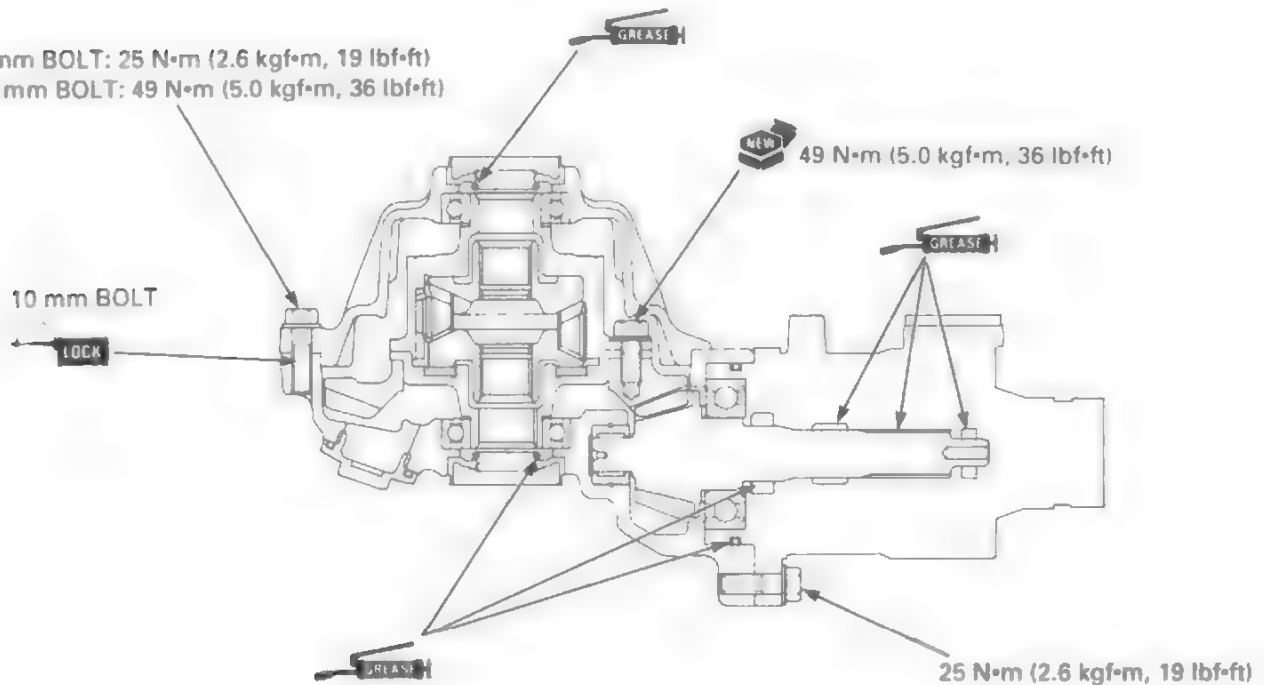
Tighten the bolts in a crisscross pattern in 2 – 3 steps.



DIFFERENTIAL ASSEMBLY (After '01)



8 mm BOLT: 25 N·m (2.6 kgf·m, 19 lbf·ft)  
 10 mm BOLT: 49 N·m (5.0 kgf·m, 36 lbf·ft)



## DIFFERENTIAL ASSEMBLY

*Keep dust and dirt out of the differential housing.*

Install the face cam into the differential housing.

Install the six cam followers A (rib) and six followers B (flat) into the specified grooves in the housing by two and two as shown.



Install the face cam onto the cam followers.

Measure the depth of the differential cap and the height of the housing-to-cam, and record them (page 15-26).

Calculate the shim thickness using the equation below. The correct shim is nearly this dimension.

$$A = B - C - 1.7 \text{ mm}$$

A: New shim thickness

B: Recorded cap depth

C: Recorded cam height

Select the shim and install it onto the face cam.

### Differential shims:

L: 1.3 mm (0.05 in)	C: 1.7 mm (0.07 in)
M: 1.4 mm (0.06 in)	D: 1.8 mm (0.07 in)
N: 1.5 mm (0.06 in)	E: 1.9 mm (0.07 in)
A: 1.6 mm (0.06 in)	

Install the cone spring with the concave side facing up (differential cap side).

Install the differential cap.

### NOTE:

- Inspect the slip torque (page 15-22) after installing the ring gear with the original bolts. If the slip torque is out specification, perform the shim adjustment. Replace the differential assembly when the replacement shim is changed by 0.3 mm or more from the selected shim (see above).

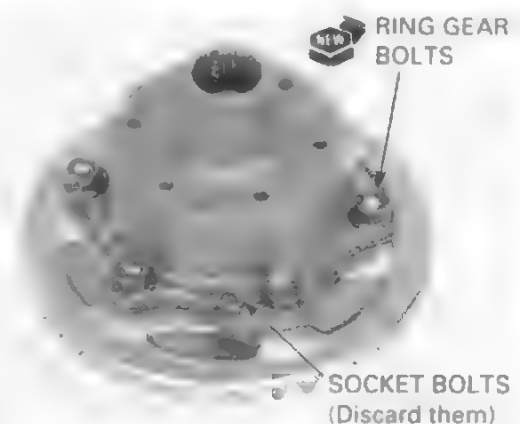
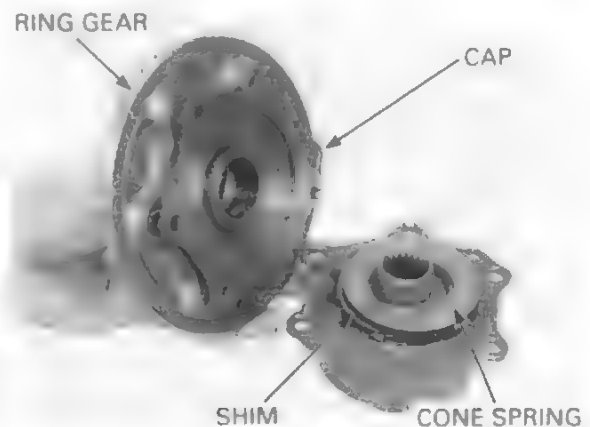
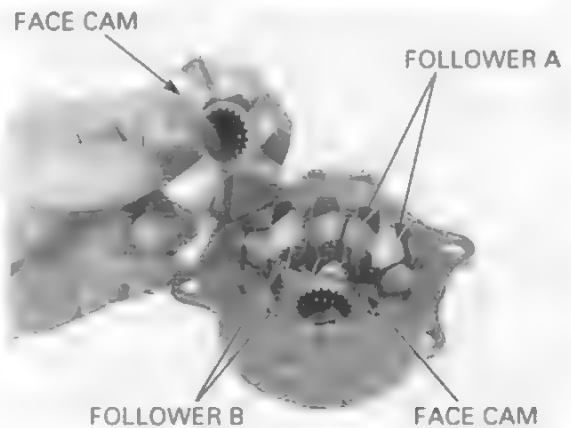
Install the ring gear onto the differential assembly with new ring gear bolts.

Tighten the six bolts in a crisscross pattern in several steps.

**TORQUE: 49 N·m (5.0 kgf·m, 36 lbf·ft)**

### NOTE:

If the differential assembly is replaced, remove the two socket bolts and discard them after installing the ring gear.



## DIFFERENTIAL CASE ASSEMBLY

### NOTE:

When the bearing, gear set and/ or gear case has been replaced, check the tooth contact pattern (page 15-18) and gear backlash (page 15-13).

Install the proper ring gear spacers onto the differential assembly.

Apply liquid sealant to the mating surface of the gear case cover.

### NOTE:

Keep dust and dirt out of the differential case.

Install the differential assembly with the spacers into the differential case.

*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening*

Apply a locking agent to the threads of the 10 mm bolts.

Tighten the cover bolts in two or three steps until the cover evenly touches the differential case.

Then, while rotating the drive pinion, tighten the bolts to the specified torque in two or three steps in a crisscross pattern.

### TORQUE:

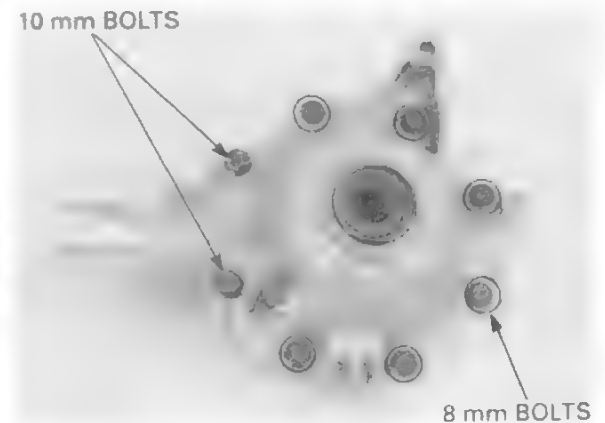
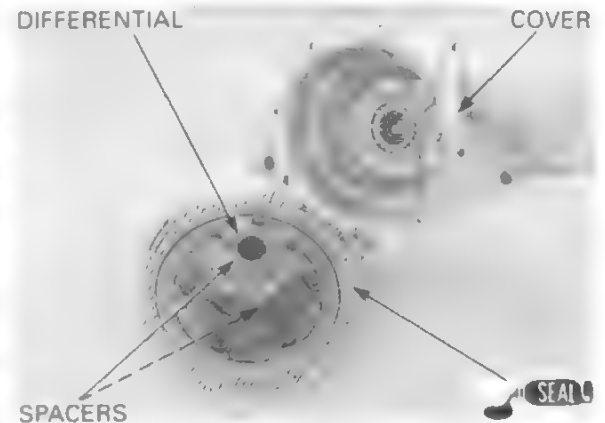
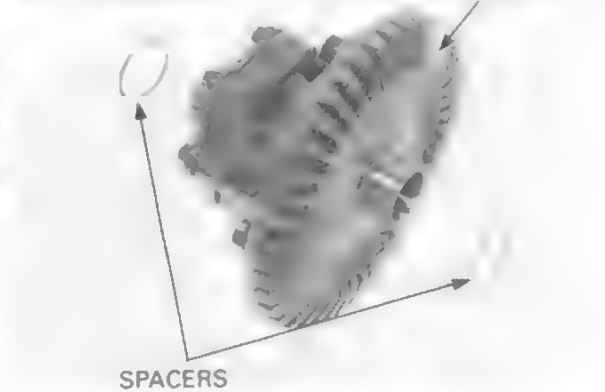
10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)

8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)

### CAUTION:

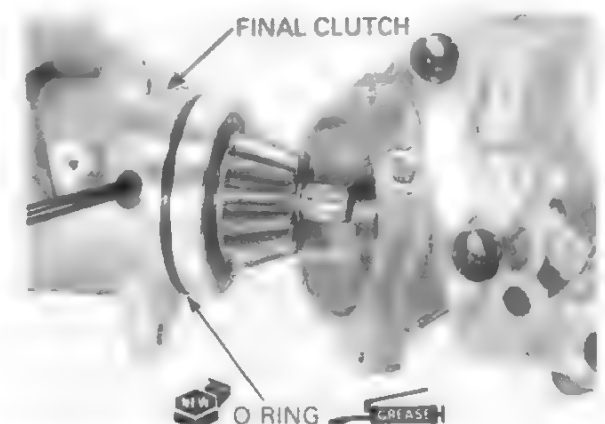
*It is important to turn the pinion while tightening the bolts. If the ring gear spacer is too thick, the gears will lock after only light tightening.*

## '98 - '01 SHOWN: DIFFERENTIAL ASSEMBLY



## FINAL CLUTCH ASSEMBLY

Apply grease to a new O-ring.  
Install the O-ring on the final clutch.  
Install the final clutch on the front differential.

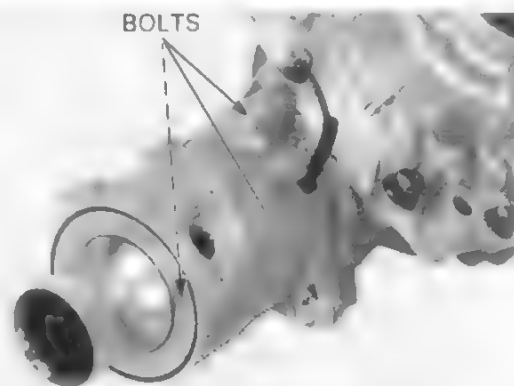




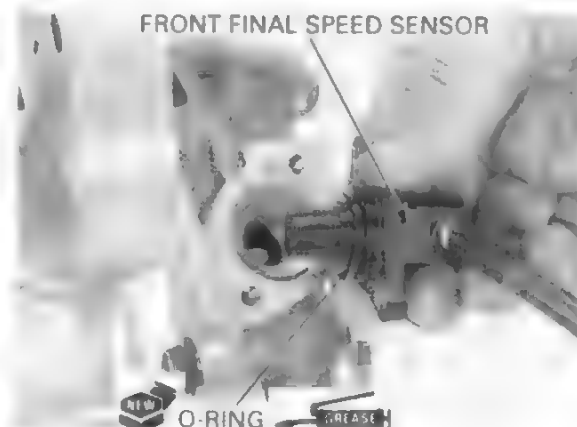
## FRONT DRIVING MECHANISM

Tighten the final clutch mounting bolts to the specified torque.

**TORQUE: 25 N·m (2.6 kgf·m, 19 lbf·ft)**

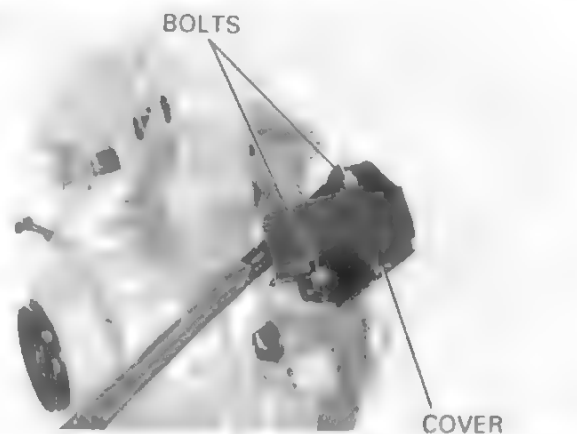


Apply grease to a new O-ring.  
Install the O-ring onto the front final clutch speed sensor.  
Install the front final clutch speed sensor.

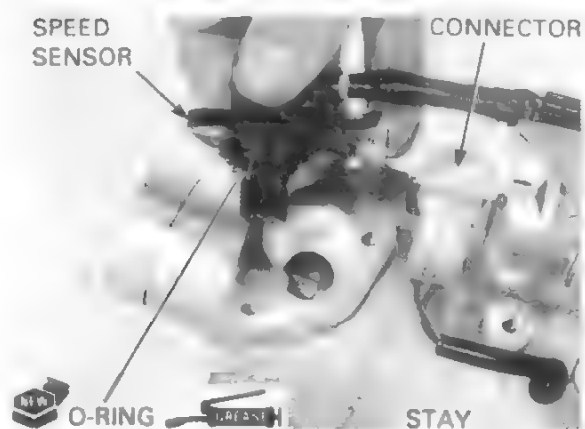


Tighten the bolts with the cover to the specified torque.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**



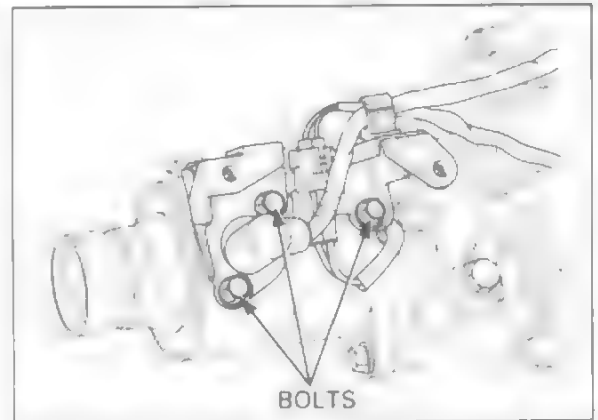
Apply grease to a new O-ring.  
Install the O-ring onto the speed sensor.  
Install the speed sensor with the stay.  
Connect the final clutch connector.



Tighten the speed sensor mounting bolts.

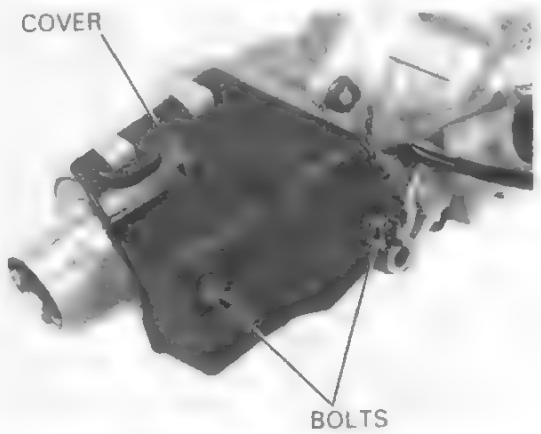
**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Tighten the stay mounting bolt.



Install the final clutch cover and tighten the bolts.

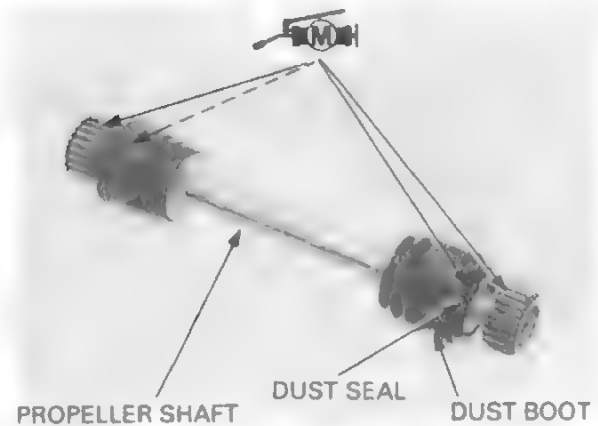
**TORQUE: 7 N·m (0.7 kgf·m, 5 lbf·ft)**



## INSTALLATION

Install the dust boot.

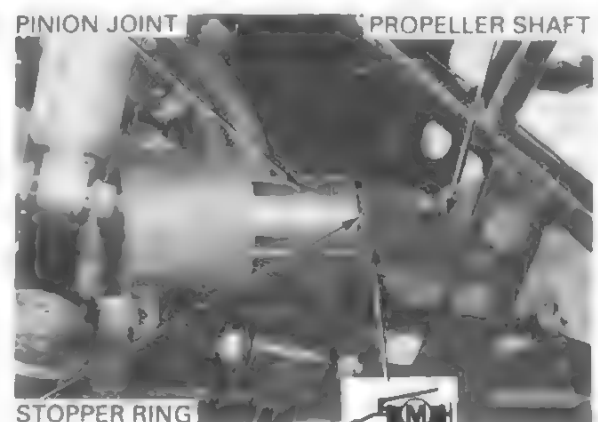
Apply molybdenum disulfide grease to the splines of the propeller shaft and dust seal.



Position the front differential forward in the chassis. Do not install the mounting bolts.

Apply 5 – 8 g of molybdenum disulfide grease to the pinion joint spline. Install the propeller shaft stopper ring side into the pinion joint without allowing the dust seal lips to turn inside out.

Set the dust boot securely.

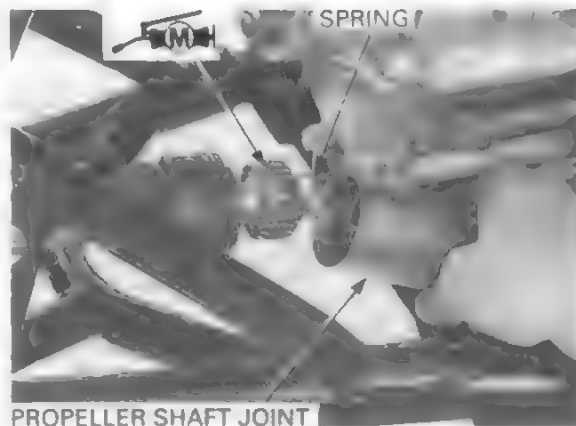


## FRONT DRIVING MECHANISM

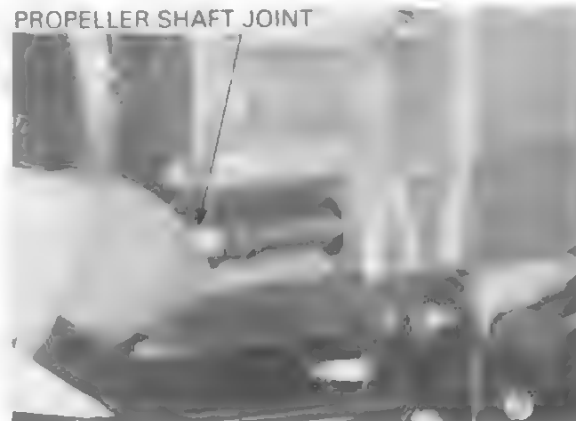
Install the O-ring on the final shaft.  
Apply 5 – 8 g of molybdenum disulfide grease to the propeller shaft joint spline.  
Push the front differential and propeller shaft slightly forward.

Install the spring and propeller shaft joint onto the shaft.

Set the dust boot securely.



Connect the propeller shaft to the engine while pulling back the propeller shaft joint.  
Rotate the shaft slightly if necessary to align the splines.



Tighten the rear mounting bolt to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



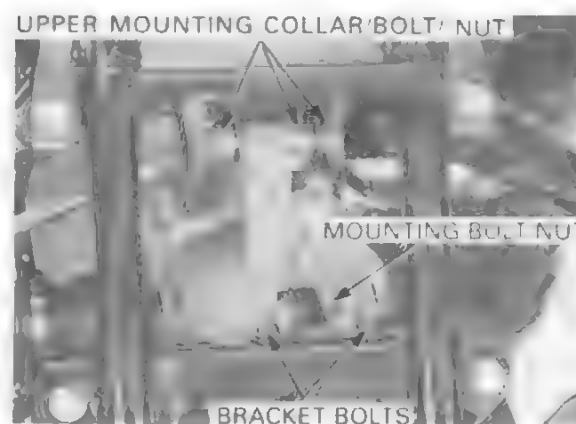
Install the upper mounting bolts with the upper mounting collar and nut in the location shown.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the front mounting bracket and tighten the bracket bolts.

Install the front mounting bolt and nut.

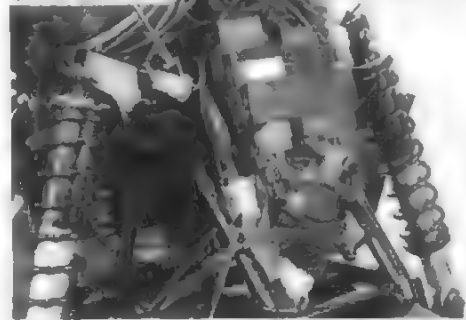
**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**



*After '01* Connect the following connectors:

- front final clutch speed sensor
- meter speed sensor
- front final clutch

METER SPEED SENSOR CONNECTOR FRONT FINAL CLUTCH CONNECTER



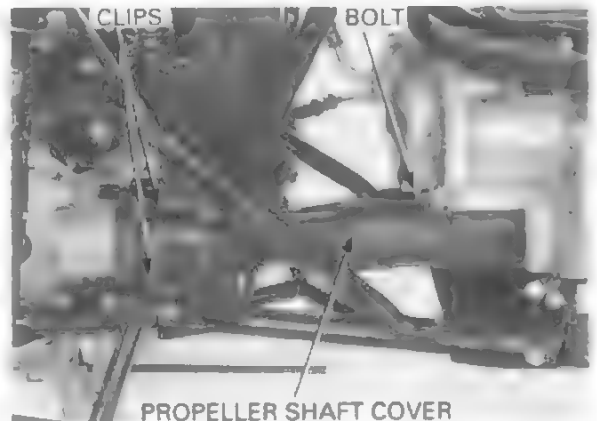
FRONT FINAL CLUTCH SPEED SENSOR CONNECTOR

*98 - 01* Install the propeller shaft cover.  
Install the retaining clips and mounting bolt, then tighten the bolt securely.

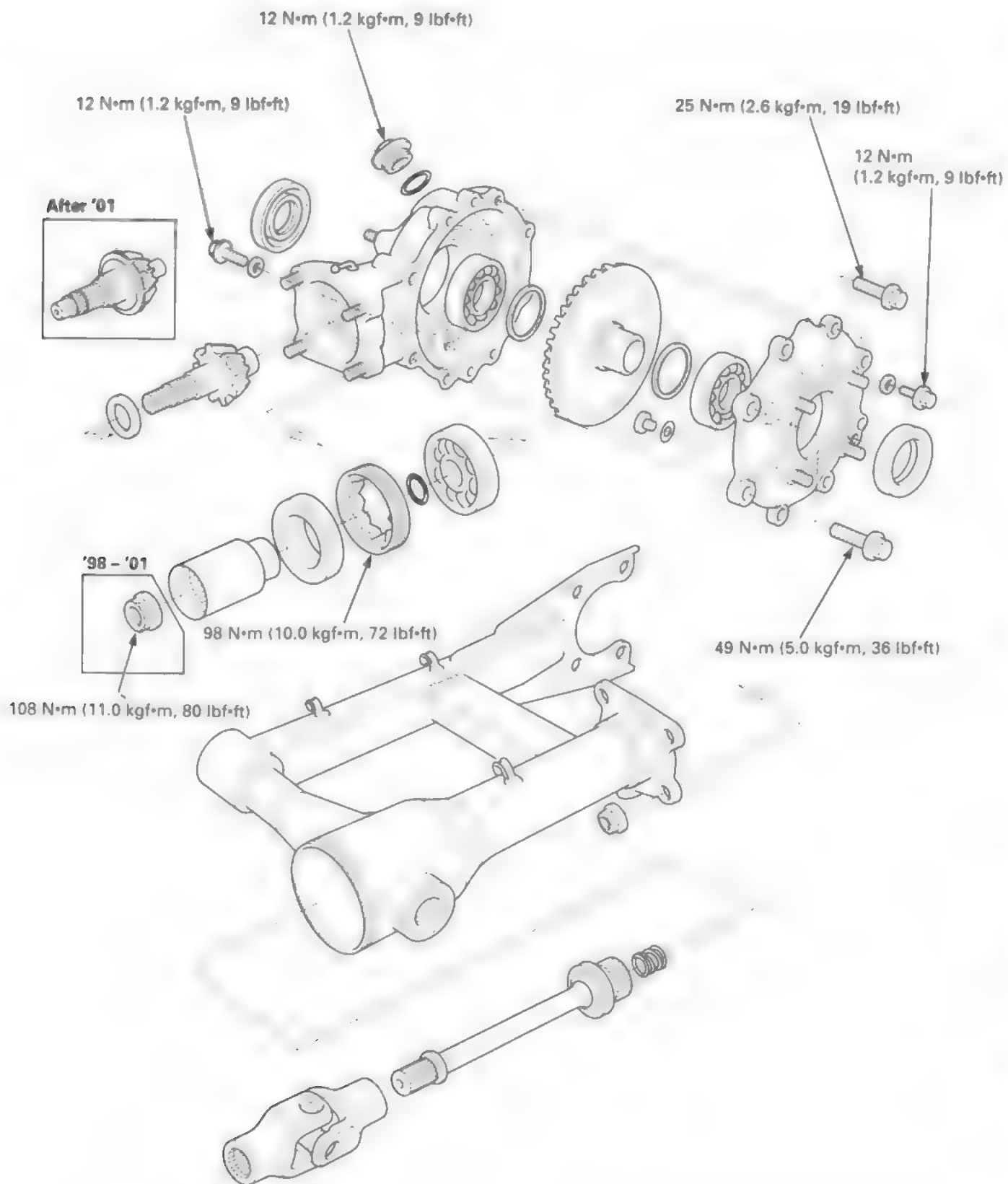
Install the following:

- Front drive shaft if removed
- Front fender (page 2-8)

Fill the front differential with the recommended oil (page 3-14).



## REAR DRIVING MECHANISM



# 16. REAR DRIVING MECHANISM

SERVICE INFORMATION	16-1	REAR FINAL DRIVE	16-6
TROUBLESHOOTING	16-2	REAR AXLE INSTALLATION	16-19
REAR AXLE REMOVAL	16-3	REAR DRIVE SHAFT	16-22

## SERVICE INFORMATION

### GENERAL

- Replace all oil seals and O rings whenever the rear final drive assembly is disassembled.
- Check the tooth contact pattern and gear backlash when the rear final drive bearing, gear set and/or gearcase are replaced.

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARDS	SERVICE LIMIT
Rear axle runout			—	3.0 (0.12)
Rear final drive	Oil capacity	After draining	90 cm <sup>3</sup> (3.0 US oz, 3.2 Imp oz)	—
		At disassembly	100 cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)	—
	Recommended oil		Hypoid gear oil SAE #80	—
	Gear backlash		0.05 – 0.30 (0.002 – 0.012)	0.40 (0.016)

### TORQUE VALUES

Gear case cover flange bolt, 8 mm	25 N·m (2.6 kgf·m, 19 lbf·ft)
Gear case cover flange bolt, 10 mm	49 N·m (5.0 kgf·m, 36 lbf·ft)
Pinion joint nut ('98 – '01)	108 N·m (11.0 kgf·m, 80 lbf·ft)
Pinion bearing lock nut	98 N·m (10.0 kgf·m, 72 lbf·ft)
Gear case drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Gear case cover oil check bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Gear case cover oil cap	12 N·m (1.2 kgf·m, 9 lbf·ft)

Apply a locking agent to the threads.

### TOOLS

Pinion holder	07SMB-HM70200
Lock nut wrench, 30 × 64 mm	07916-MB00002 or 07916-MB00001
Pinion puller set	07HMC-MM80101 (Not available in U.S.A.)
– Shaft puller	07931-ME40000 or
	07931-ME4010B and 07931-HB3020A (U.S.A. only)
– Pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Driver	07749-0010000
Attachment, 52 × 55 mm	07746-0010400
Attachment, 62 × 68 mm	07746-0010500
Attachment, 24 × 26 mm	07746-0010700
Driver attachment	07965-KE80200 or 07947-KA50100
Pilot, 28 mm	07746-0041100
Pilot, 32 × 35 mm	07MAD-PR90200
Driver, 40 mm I.D.	07746-0030100
Attachment, 25 mm I.D.	07746-0030200

### TROUBLESHOOTING

#### REAR FINAL DRIVE

##### Excessive noise

- Worn or scored ring gear shaft and driven flange
- Scored driven flange and wheel hub
- Worn or scored drive pinion and splines
- Worn pinion and ring gears
- Excessive backlash between pinion and ring gear
- Oil level too low

#### REAR AXLE

##### Wobble or vibration in vehicle

- Axle not tightened properly
- Bent axle

##### Oil leak

- Oil level too high
- Clogged breather hole or tube
- Worn or damaged oil seal
- Loose gear case cover bolt

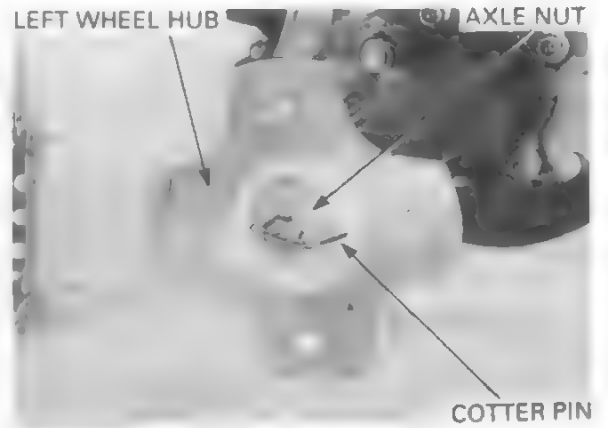
## REAR AXLE REMOVAL

### NOTE:

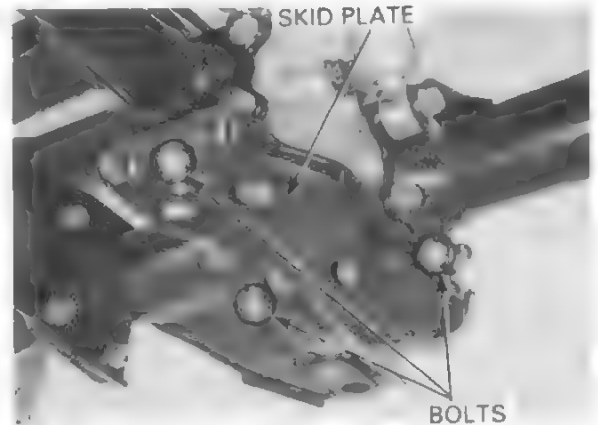
It is not necessary to disassemble the brake panel.

Remove the right and left rear wheels (page 13-3).

Remove the cotter pin, axle nut and rear wheel hubs.

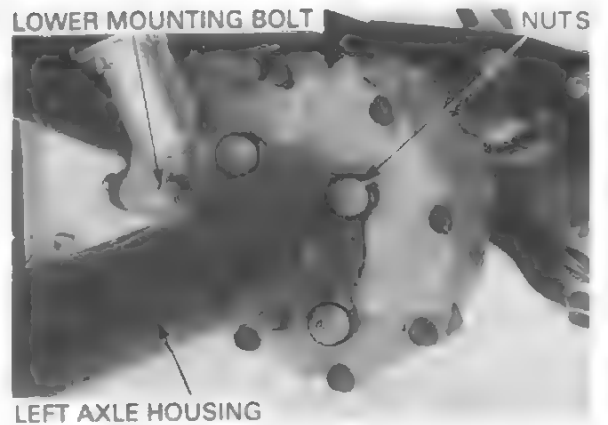


Remove the three bolts and rear final drive skid plate.

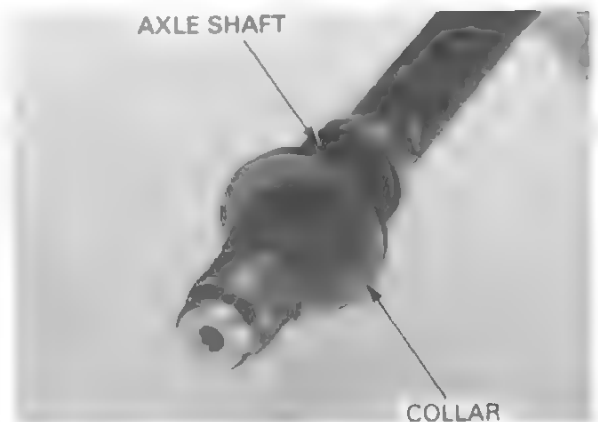


Remove the left shock absorber lower mounting bolt.

Remove the nuts and left rear axle housing and O-ring.  
Discard the mounting nuts.



Remove the collar from the axle shaft.





## REAR DRIVING MECHANISM

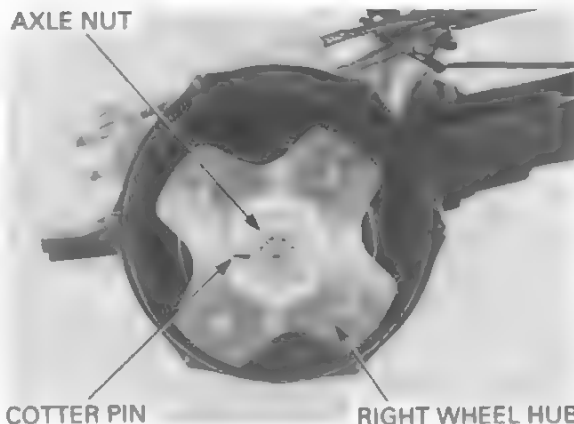
Remove the cotter pin, axle nut and right rear wheel hub.

Remove the brake drum cover and brake drum (page 14-15).

AXLE NUT

COTTER PIN

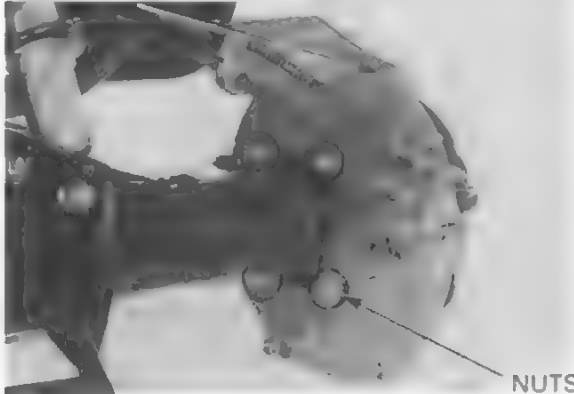
RIGHT WHEEL HUB



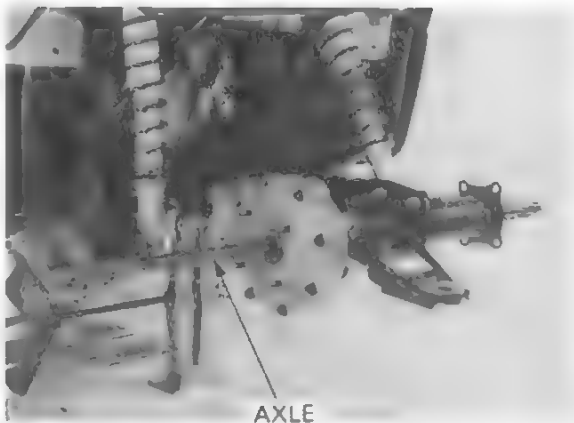
Remove the nuts and rear brake panel assembly. Discard the mounting nuts.

BRAKE PANEL ASSEMBLY

NUTS



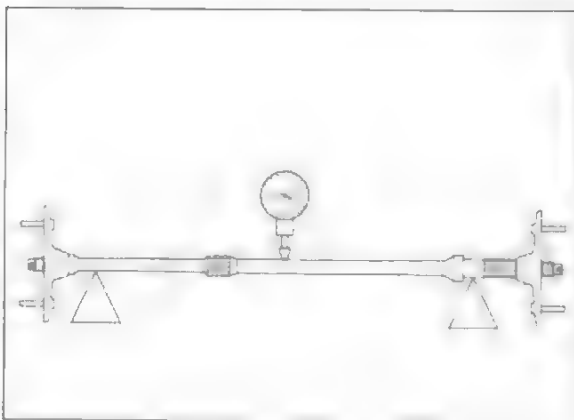
Drive the axle out from the left side with a rubber hammer.



### INSPECTION

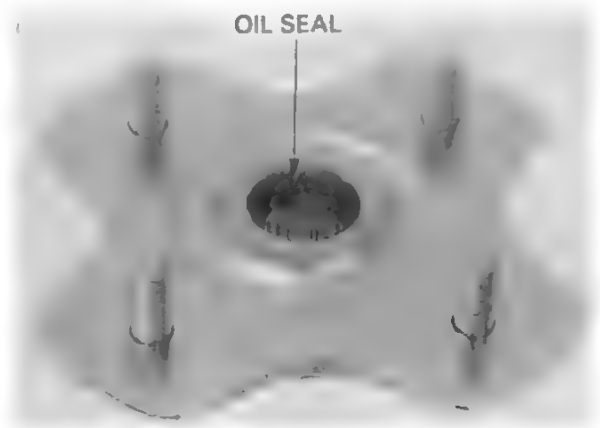
Install the wheel hubs onto both end of the axle. Place the rear axle in V-block and measure the runout.

**SERVICE LIMIT: 3.0 mm (0.12 in)**

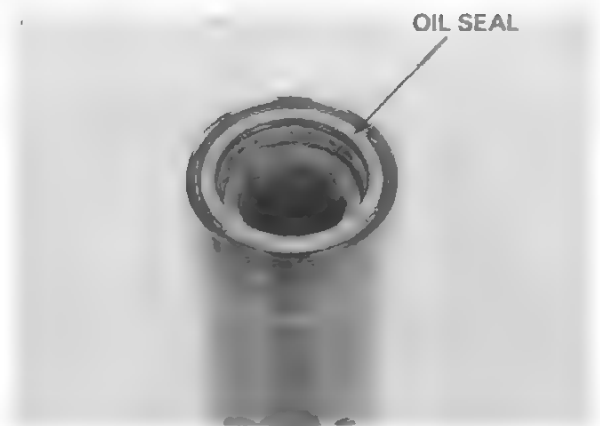


Inspect the wheel hub oil seal for damage.

Replace the oil seal if necessary.

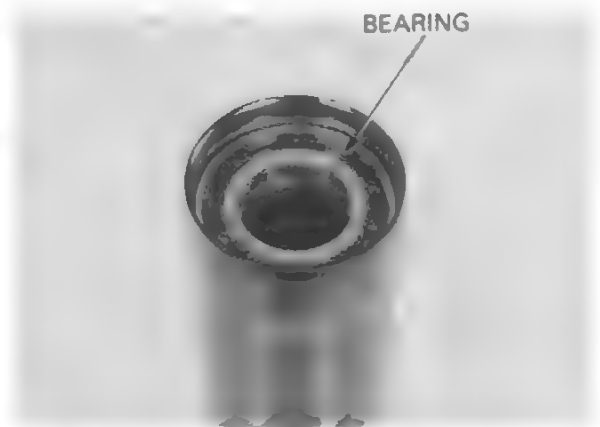


Inspect the left final drive housing oil seal for damage.



Turn the inner race of the bearing with your finger. The bearing should turn smoothly and quietly. Also check that the outer race fit tightly in the housing. Remove and discard the bearing if the races do not turn smoothly and quietly, or if they fit loosely in the housing.

Replace the oil seal and bearing if necessary.



## BEARING REPLACEMENT

Remove the oil seal.

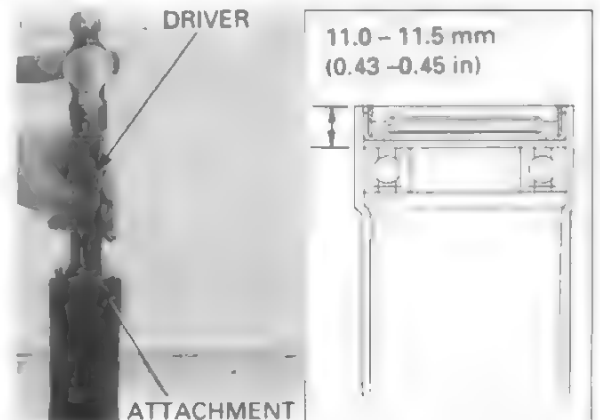
Drive out the bearing out of the left axle housing.

Drive the bearing into the housing with its sealed end facing in using the special tools to the specified depth.

**BEARING DEPTH: 11.0 – 11.5 mm (0.43 – 0.45 in)**

### TOOLS:

Driver	07749-0010000
Attachment, 52 X 55 mm	07746-0010400
Pilot, 32 X 35 mm	07MAD-PR90200



## REAR DRIVING MECHANISM

Drive the oil seal into the housing using the special tools.

### TOOLS:

Driver

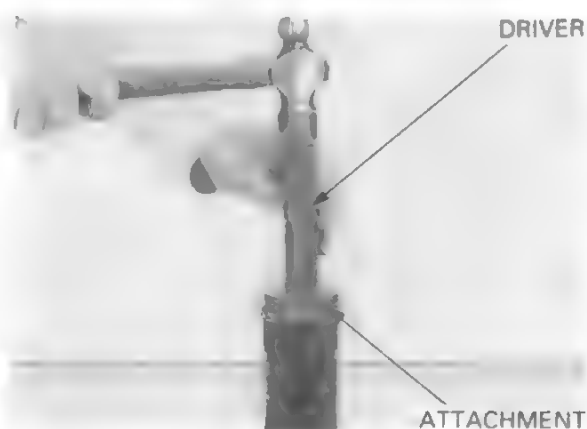
07749-0010000

Attachment, 62 × 68 mm

07746-0010500

Pilot, 32 × 35 mm

07MAD-PR90200



## REAR FINAL DRIVE

### GEAR CASE REMOVAL

#### NOTE:

It is not necessary to disassemble the brake panel.

Drain the oil from the rear final drive (page 3-14).  
Remove the rear axle shaft (page 16-3).

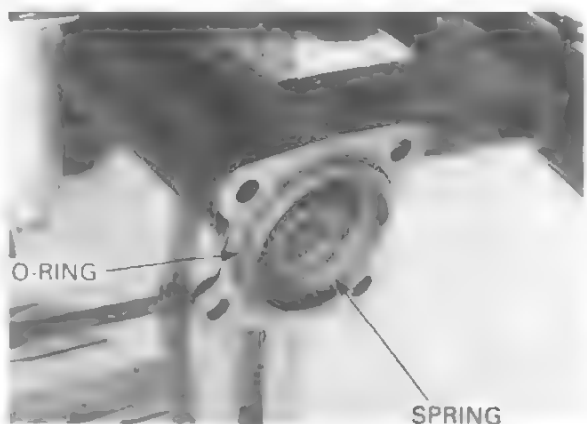
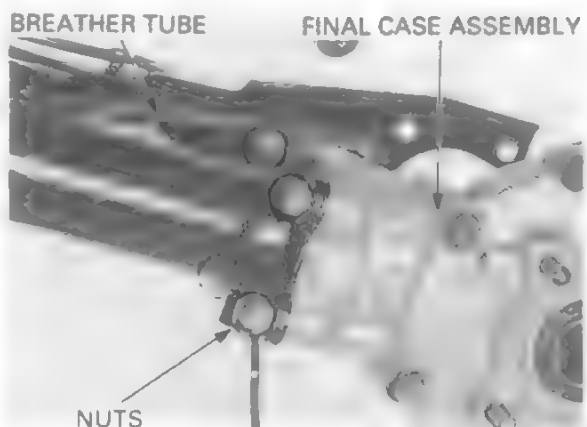
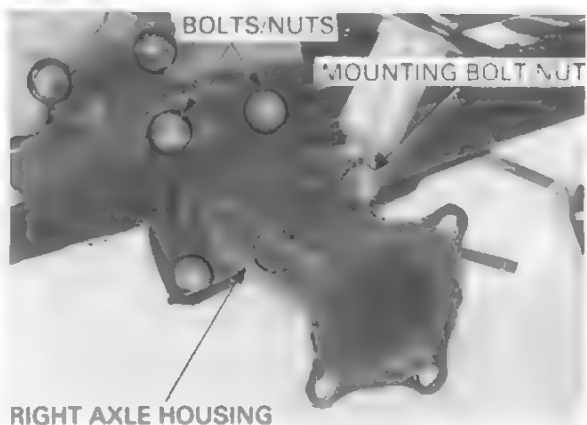
Remove the right shock absorber lower mounting bolt/nut.

Remove the right rear axle housing mounting bolts, nuts and rear axle housing.  
Discard the right differential case mounting nuts.

Disconnect the rear final case breather final case assembly.  
Discard the mounting nuts.

Remove the O-ring from the final drive case.

Remove the spring from the drive shaft joint.



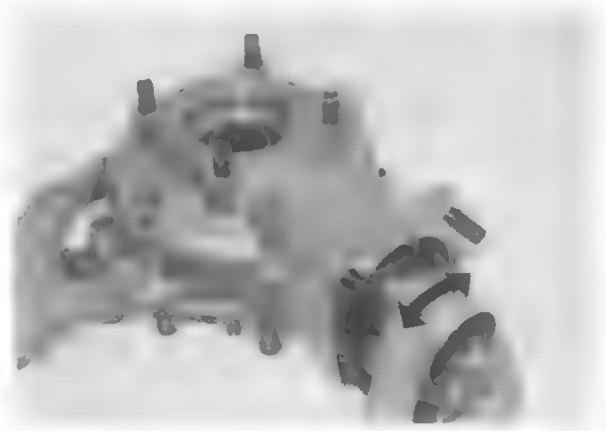
## INSPECTION

Turn the drive pinion with your finger; it should turn smoothly and quietly.

Inspect the following if the drive pinion does not turn smoothly and quietly.

- Final drive case
- Ring gear bearings
- Drive pinion
- Ring gear

Proceed with the detailed inspection procedures that follow and replace faulty parts/assemblies as required.



## BACKLASH INSPECTION

Remove the oil filler cap.

Set the gear case on the vise and hold the pinion joint using the special tools as shown.

### TOOLS:

Pinion holder

07SMB-HM70200



Set a horizontal type dial indicator on the ring gear, through the oil filler hole.

Rotate the ring gear by hand until gear slack is taken up.

Turn the ring gear back and forth to read backlash.

**STANDARD:** 0.05 – 0.30 mm (0.002 – 0.012 in)

**SERVICE LIMIT:** 0.40 mm (0.016 in)

Remove the dial indicator.

Turn the ring gear and measure the backlash.

Repeat this procedure once more.

Compare the difference of the three measurements.

### DIFFERENCE OF MEASUREMENT

**SERVICE LIMIT:** 0.25 mm (0.010 in)

If the difference in measurements exceeds the limit, it indicates that either the bearing is not installed squarely, or the case is deformed.

Inspect each bearing and case.

## REAR DRIVING MECHANISM

If backlash is too small, replace the ring gear left side spacer with a thicker one. Backlash is changed by about 0.06 mm (0.002 in) when thickness of the spacer is changed by 0.12 mm (0.005 in).

### RING GEAR SPACERS:

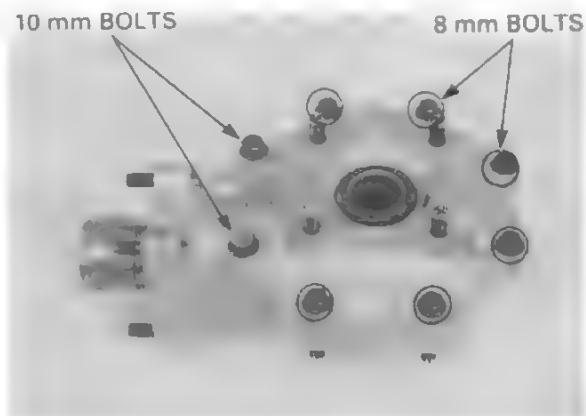
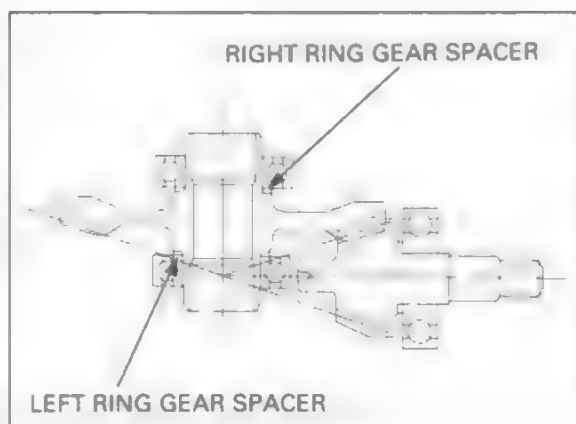
Nine spacers (from A to I) are available in thickness intervals of 0.06 mm.

- Standard: 2.00 mm (0.079 in)
- Thinnest: 1.82 mm (0.072 in)
- Thickest: 2.30 mm (0.091 in)

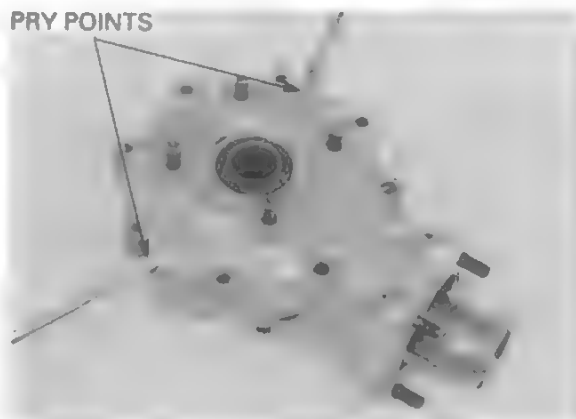
Change the right side spacer and equal thickness and opposite amount of what the left side spacer was changed; if the left spacer was replaced with a 0.12 mm (0.005 in) thicker spacer, replace the right spacer with one that is 0.12 mm (0.005 in) thinner.

### GEAR CASE DISASSEMBLY

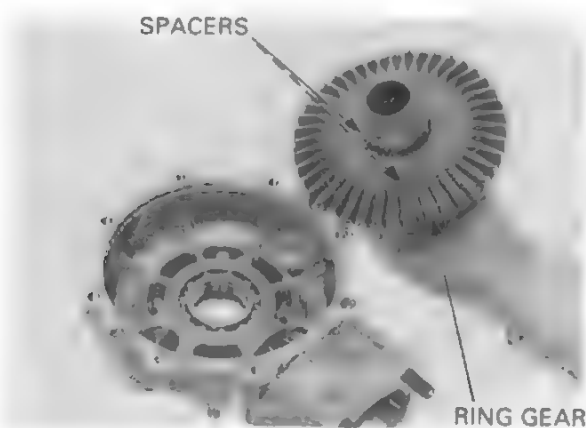
Remove the cover bolts in 2 – 3 steps in a crisscross pattern to prevent gear case warpage.



Carefully pry the cover off the case using a screwdriver at the pry points shown.



Remove the ring gear and spacers.



## BEARING INSPECTION

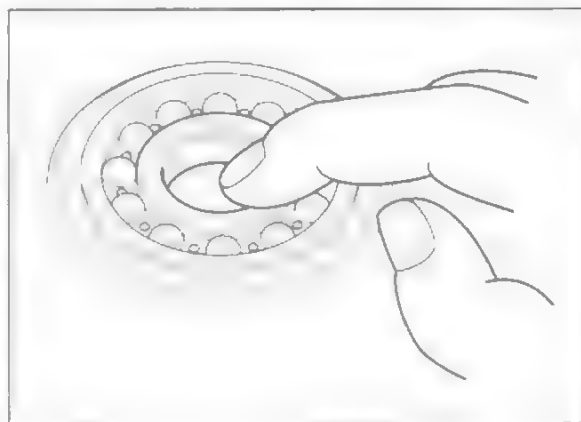
Turn the inner race of each ring gear bearing with your finger.

The bearings should turn smoothly and quietly. Also check that the outer race fits tightly in the case and cover.

Remove and discard the bearings if the races do not turn smoothly and quietly, or if they fit loosely in the case or cover.

For ring gear bearing replacement, go to page 16-13.

For drive pinion removal and disassembly, go to page 16-11.



## GEAR TOOTH CONTACT PATTERN CHECK

Clean all sealing material off the mating surfaces of the gear case and cover.

### NOTE:

- Keep dust and dirt out of the gear case.
- Be careful not to damage the mating surface.

Apply a thin coat of Prussian Blue to the pinion gear teeth for a gear tooth contact pattern check. Install the ring gear with the spacers into the gear case.

Tighten the cover bolts in 2 or 3 steps until the cover evenly touches the gear case.

Then, while rotating the drive pinion, tighten the bolts to the specified torque in 2 – 3 steps in a criss-cross pattern.

### TORQUE:

10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)

8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)

### CAUTION:

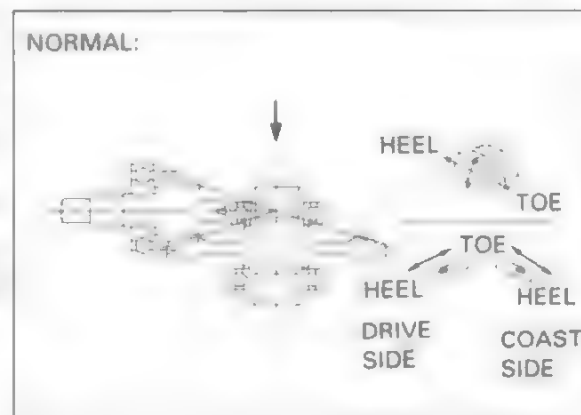
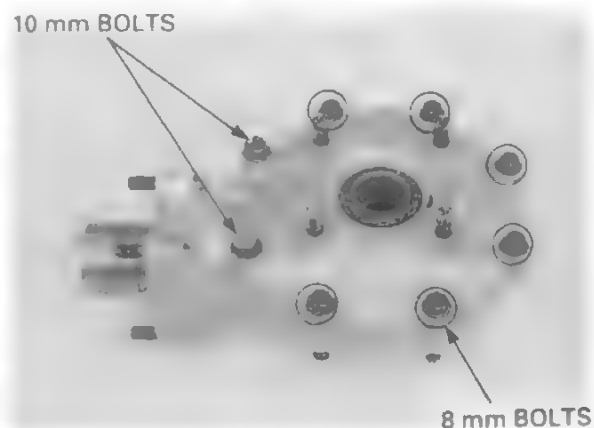
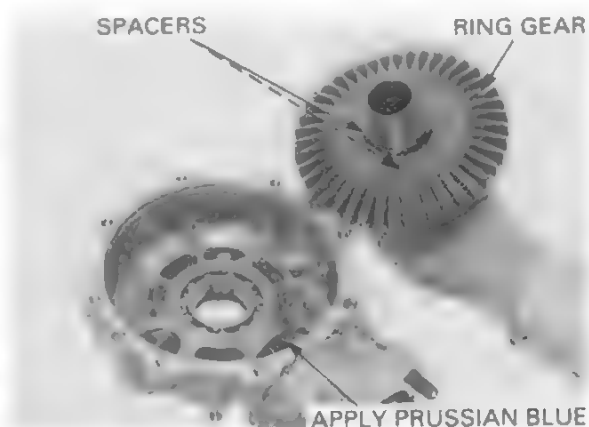
*It is important to turn the pinion while tightening the bolts. If the ring gear spacer is too thick, the gears will lock after only light tightening.*

Remove the oil filler cap from the gear case. Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

The pattern is indicated by the Prussian Blue applied to the pinion before assembly.

Contact is normal if the Prussian blue is transferred to the approximate center but slightly to the heel side of each tooth and to the flank side.



## REAR DRIVING MECHANISM

If the patterns are not correct, remove and replace the pinion spacer with one of an alternate thickness. Replace the pinion spacer with a thicker one if the contacts are too high, toward the face. Replace the pinion spacer with a thinner one if the contacts are too low, to the flank side. The pattern will shift about 0.5 – 1.0 mm (0.002 – 0.04 in) when the thickness of the spacer is changed by 0.10 mm (0.004 in)

### PINION SPACERS ([ ]: After '01):

L [A]: 1.64 mm (0.064 in)

M [B]: 1.70 mm (0.067 in)

N [C]: 1.76 mm (0.069 in)

A [D]: 1.82 mm (0.072 in)

B [E]: 1.88 mm (0.074 in)

C [F]: 1.94 mm (0.076 in)

D [G]: 2.00 mm (0.079 in)

E [H]: 2.06 mm (0.081 in)

F [I]: 2.12 mm (0.083 in)

G [J]: 2.18 mm (0.086 in)

For pinion spacer replacement, go to page 16-11.

### TOO HIGH:

PINION  
SPACER

FACE  
↑  
DRIVE SIDE

FACE  
↑  
COAST SIDE

### TOO LOW:

PINION  
SPACER

FACE  
↑  
DRIVE SIDE

FACE  
↑  
COAST SIDE

## DRIVE PINION REMOVAL

'98 - '01: Install the pinion holder on the pinion joint and secure in a vise as shown.

### TOOL:

Pinion holder

07SMB-HM70200

'98 - '01: Remove the pinion joint nut, then remove the pinion holder and pinion joint.

Remove the pinion joint and O-ring.  
Remove the oil seal.

PINION HOLDER

Unstake the pinion bearing lock nut with a drill or grinder.

Be careful that metal particles do not enter the bearing and that the threads are not damaged.

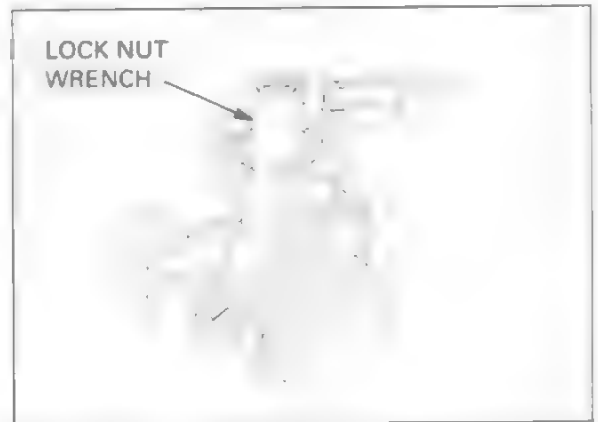
UNSTAKE

LOCK NUT

Remove the pinion bearing lock nut using the special tool as shown.

**TOOL:**

Lock nut wrench, 30 X 64 mm 07916-MB00002 or  
07916-MB00001

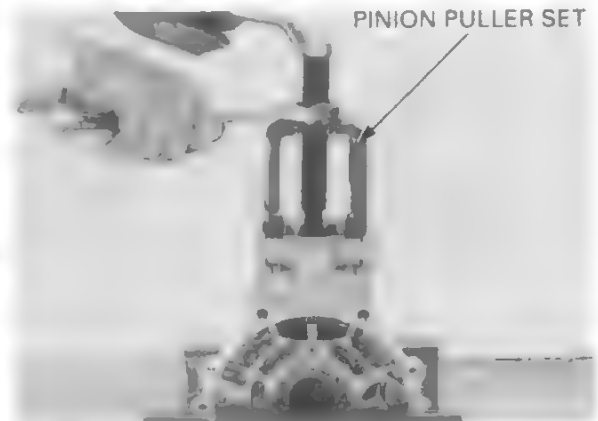


Install the pinion puller attachment tool onto the gear case.

Screw the shaft puller onto the threads of the drive pinion.

Turn the 23 mm special nut counterclockwise with a 23 mm wrench while holding the shaft with a 17 mm wrench to remove the drive pinion from its housing.

Pull the drive pinion assembly off with the shaft puller.



**TOOLS:**

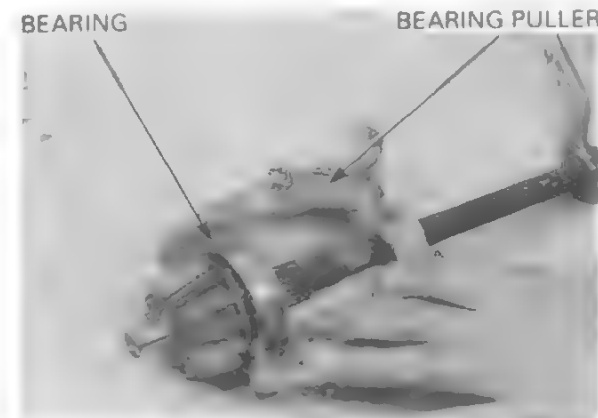
Pinion puller set	07HMC-MM80101
- Shaft puller	07931-ME40000
- Pinion puller base	07HMC-MM80110
or U.S.A. Only:	
Shaft puller	07931-ME4010B
Special nut	07931-HB3020A
Pinion puller base "A"	07HMC-MM8011A

Blow compressed air through the breather hole in the gear case.



## DRIVE PINION DISASSEMBLY/ ASSEMBLY

Pull the bearing off the shaft with a bearing puller.  
Remove the pinion adjustment spacer.



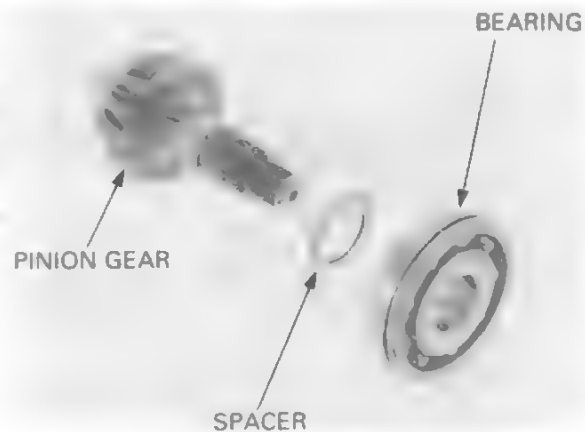


## REAR DRIVING MECHANISM

To reassemble, first install the pinion spacer.

### NOTE:

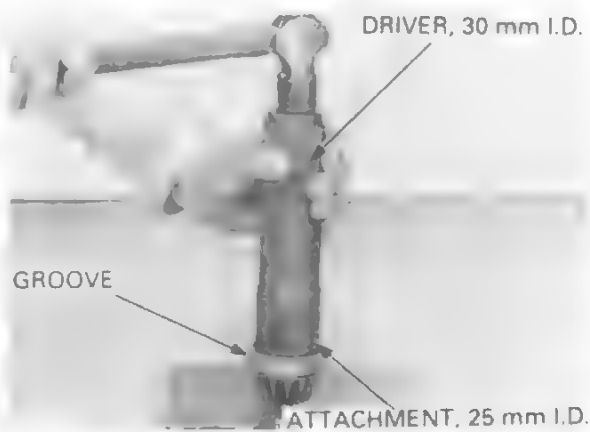
When the gear set, pinion bearing and/or gear case has been replaced, use a 2.0 mm (0.08 in) thick spacer.



Apply #80 gear oil to the bearing. Press the bearing onto the drive pinion with its groove side facing out using the special tools as shown.

### TOOLS:

Driver, 40 mm I.D.	07746-0030100
Attachment, 25 mm I.D.	07746-0030200



## PINION NEEDLE BEARING REPLACEMENT

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole. Bend up the end of the ring with a screwdriver. Grasp the end of the ring with needle-nosed pliers and pull the stopper ring out through the access hole.

Heat the final gear case to 80°C (176°F) and remove the pinion needle bearing by using the special tool.

### TOOLS:

Bearing remover, 14 mm	07WMC-KFG0100
Remover shaft, 15 mm	07936-KC10100
Remover weight	07741-0010201
USA only:	
Bearing remover, 15 mm	07936-KC10200
Remove shaft, 14 mm	07YMC-001010A
Remover weight	07936-371020A or 07936-3710200
Remover handle	07936-3710100

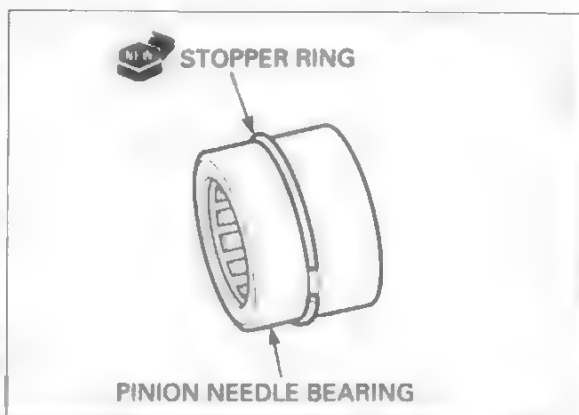
### WARNING

*Be sure to wear heavy gloves to avoid burns when handling the heated gear case.*

Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

### CAUTION:

*Using a torch to heat the gear case may cause warpage.*

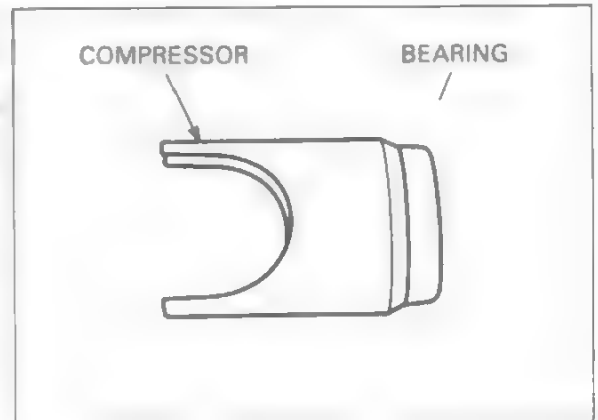


Install the stopper ring into the groove in the bearing. Install the bearing into the compressor until the bearing is flush with the end of the tool. Place the driver on top of the bearing and tape the driver to the compressor. Place the assembly into a freezer for at least 30 minutes.

## TOOLS:

**Driver** 07749-0010000  
**Differential bearing ring compressor** 07YME-HN4010A

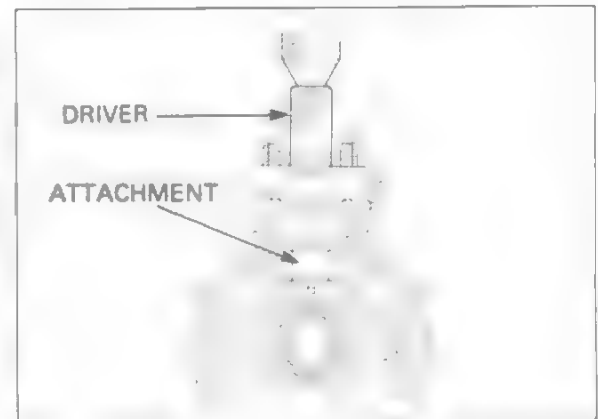
'98 - '01 **Attachment 24 × 26 mm** 07746-0010700  
 After 01: **Attachment 22 × 24 mm** 07746-0010800  
 After 01: **Pilot, 14 mm** 07746-0041200



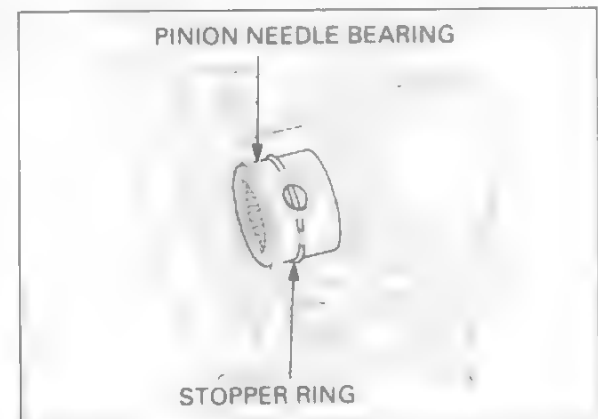
Heat the gear case to 80°C (176°F).

Remove the needle bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new one.

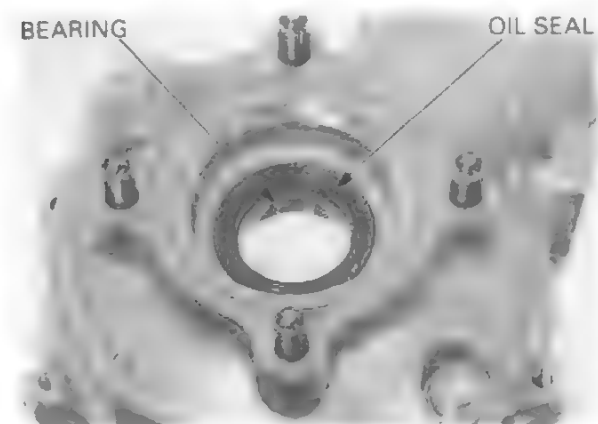


Make sure that the stopper ring is securely set in the groove of the final gear case.



## CASE BEARING REPLACEMENT

Remove the oil seal.  
 Drive the ring gear bearing out of the case.

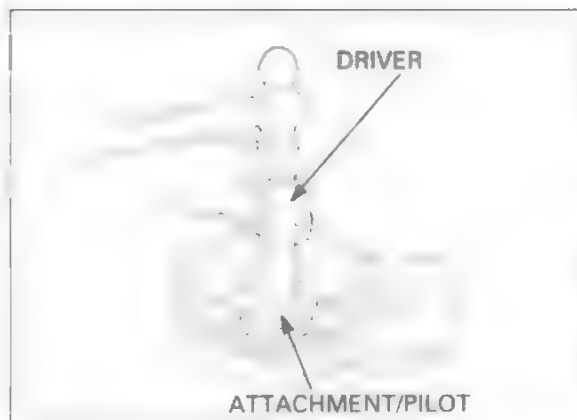


## REAR DRIVING MECHANISM

Drive the ring gear bearing into the cover using the special tools as shown.

### TOOLS:

Driver	07749-0010000
Attachment, 62 X 68 mm	07746-0010500
Pilot, 35 mm	07746-0040800

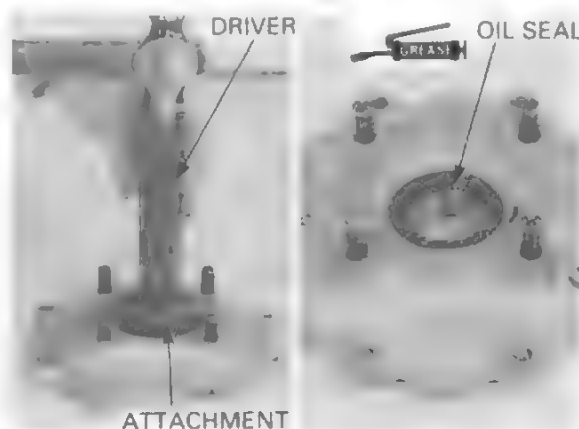


Drive a new oil seal into the cover using the special tools.

### TOOLS:

Driver	07749-0010000
Attachment, 52 X 55 mm	07746-0010400

Apply grease to the oil seal lips.



Install the ring gear with the spacer into the cover. Measure the clearance between the ring gear and the ring gear stop pin with a feeler gauge.

**CLEARANCE:** 0.30 - 0.60 mm (0.012 - 0.024 in)

Remove the ring gear.

If the clearance exceeds the standard, heat the cover to approximately 80°C (176°F) and remove the stop pin by tapping the cover.

### ⚠ WARNING

*Always wear gloves when handling the cover after it has been heated to prevent burning your hands.*

### CAUTION:

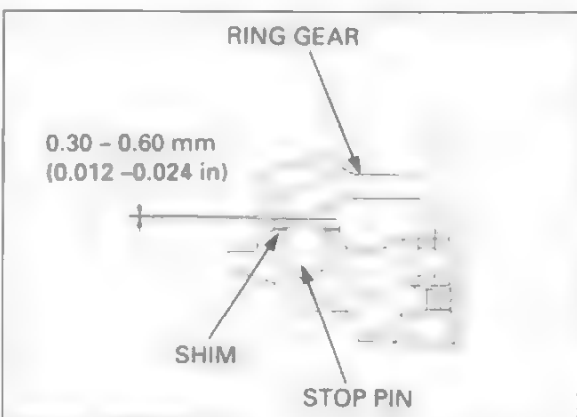
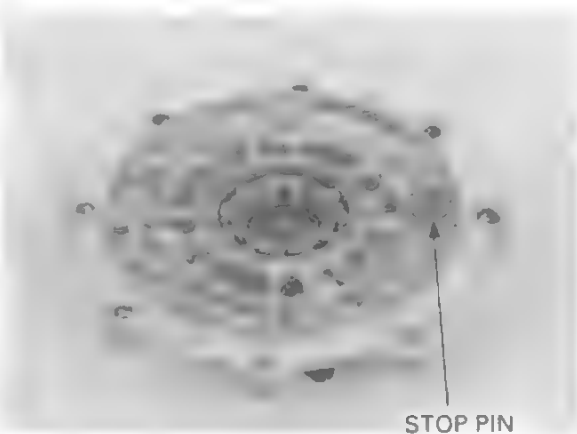
*Do not use a torch to heat the cover, it may cause warping.*

Install a stop pin shim to obtain the correct clearance.

### SHIM THICKNESS:

- A: 0.10 mm (0.004 in)
- B: 0.15 mm (0.006 in)

Install the shim and drive the stop pin into the cover.



## DRIVE PINION INSTALLATION

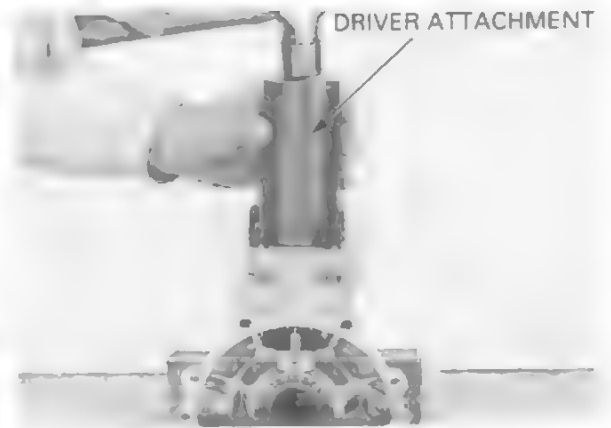
Place the drive pinion assembly into its housing and drive it into the gear case.

### TOOL:

**Driver attachment** 07965-KE80200 or  
07947-KA50100

### NOTE:

Keep the driver centered with the bearing outer race during installation.



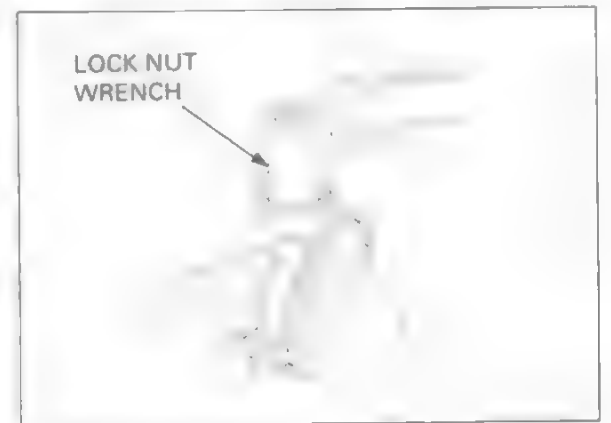
Install and tighten the pinion bearing lock nut using the special tools as shown.

**TORQUE:** 98 N·m (10.0 kgf·m, 72 lbf·ft)

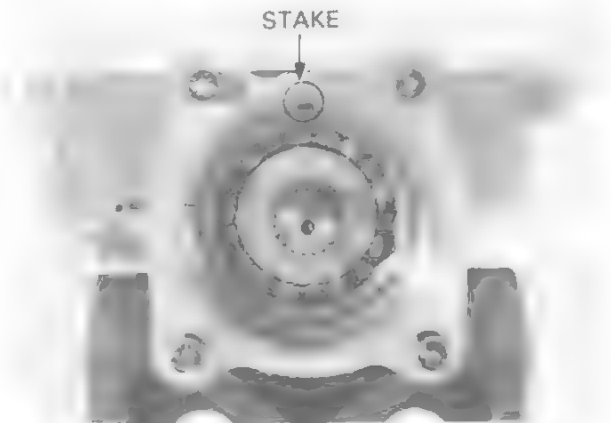
**Wrench scale reading:** 88 N·m (9.1 kgf·m, 66 lbf·ft)  
using a 50 cm (20 in) long torque wrench

### TOOL:

**Lock nut wrench, 30 X 64 mm** 07916-MB00002 or  
07916-MB00001



Stake the pinion bearing lock nut.

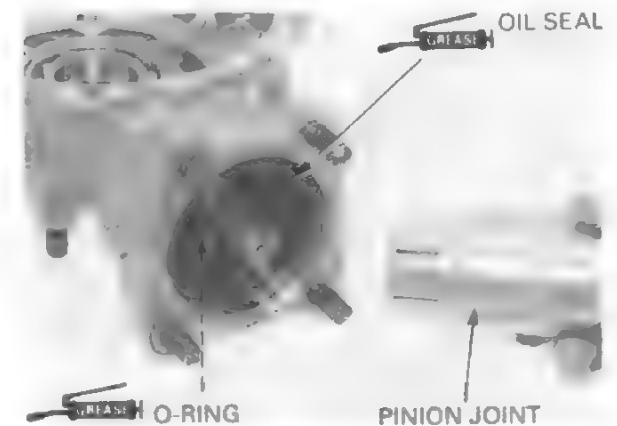


Apply grease to the new drive pinion oil seal lips.  
Install the new drive pinion oil seal on the case.

Install the O-ring onto the pinion shaft.

98 - 01 Apply a locking agent to the pinion threads.  
Install the pinion joint and joint nut.

After '01 Install the pinion joint.



## REAR DRIVING MECHANISM

'98 - '01: Attach the pinion holder on the pinion joint and secure in a vise.  
Tighten the pinion joint nut to the specified torque.

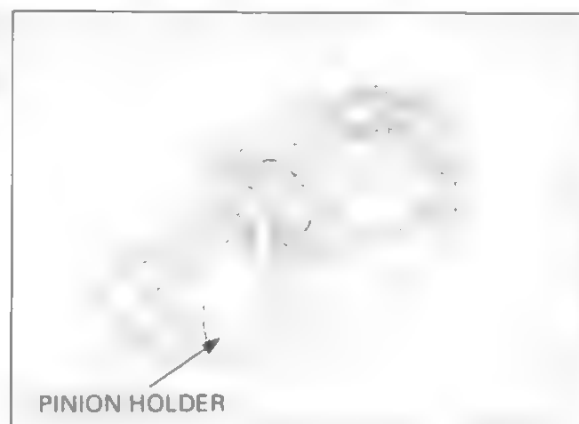
**TOOL:**

Pinion holder

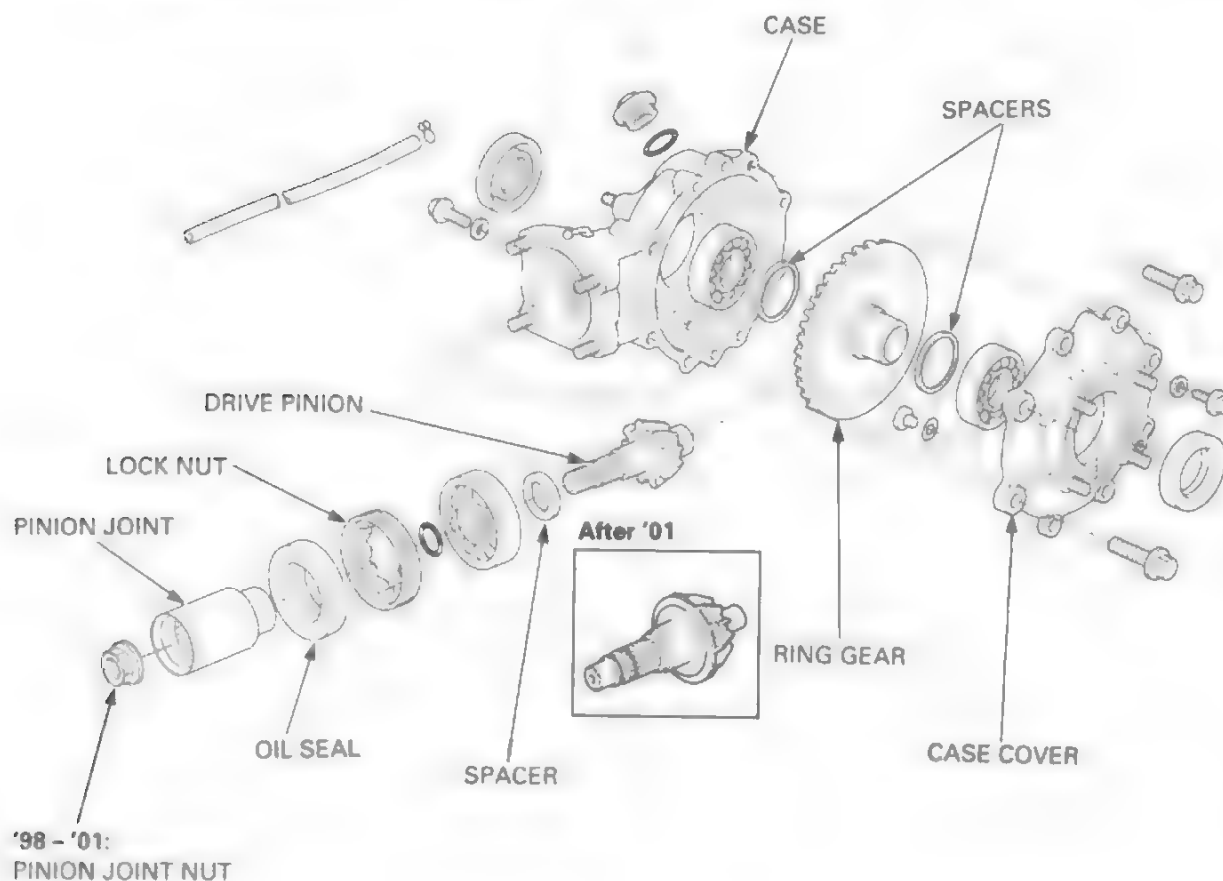
07SMB-HM70200

**TORQUE:** 108 N·m (11.0 kgf·m, 80 lbf·ft)

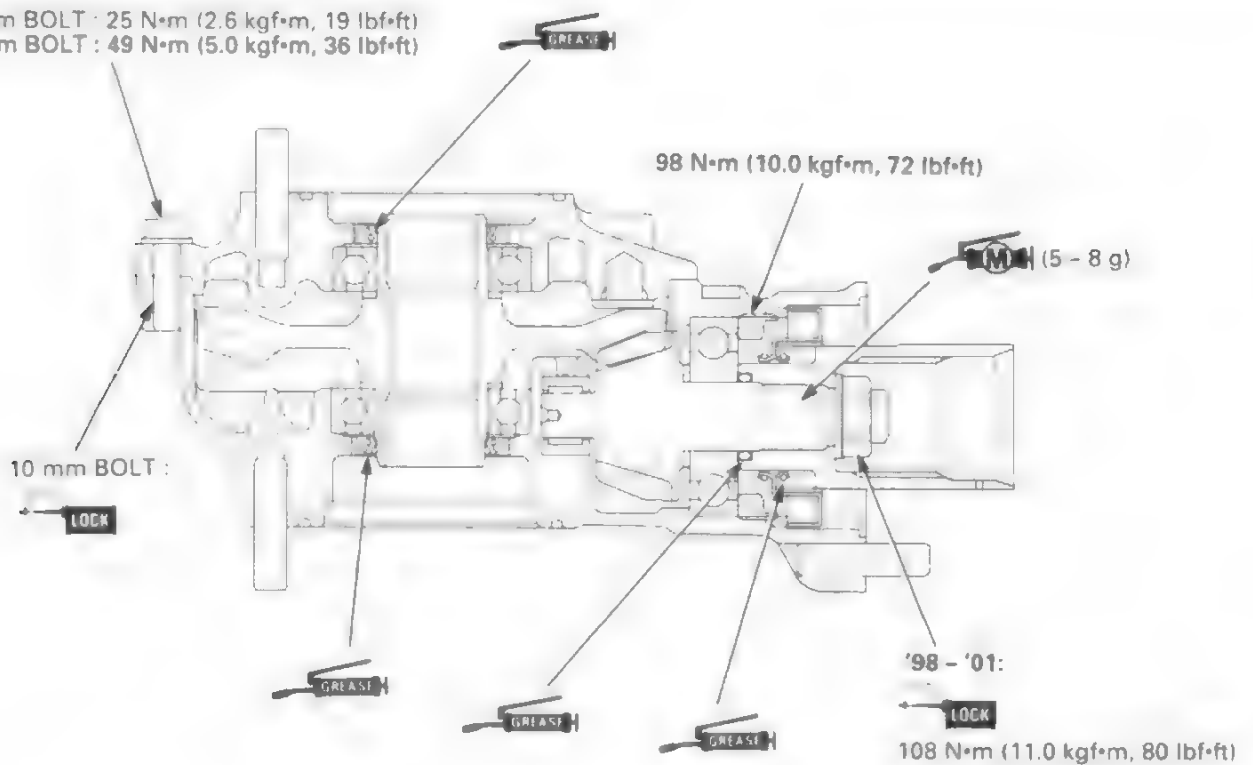
Remove the pinion holder.



## GEAR CASE ASSEMBLY



8 mm BOLT : 25 N·m (2.6 kgf·m, 19 lbf·ft)  
10 mm BOLT : 49 N·m (5.0 kgf·m, 36 lbf·ft)



## NOTE:

When the bearing, gear set and/or gear case has been replaced, check the tooth contact pattern (page 16-9) and gear backlash (page 16-7).

Keep dust and dirt  
out of the gear  
case

Install the ring gear spacers onto the ring gear.  
Install the ring gear, with the spacers, into the final drive case.

Apply liquid sealant to the mating surface of the gear case cover.

Apply a locking agent to the threads of the 10 mm bolts.

Tighten the cover bolts in two or three steps until the cover evenly touches the gear case.

Then, while rotating the drive pinion, tighten the bolts to the specified torque in two or three steps in a crisscross pattern.

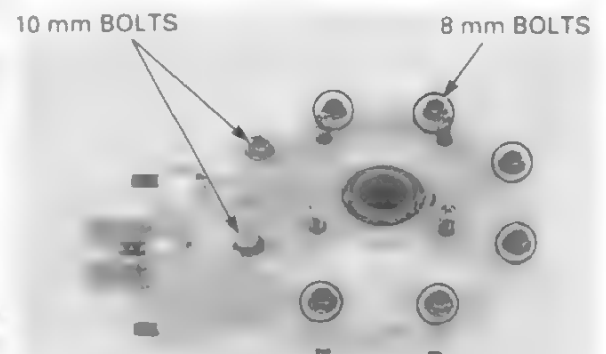
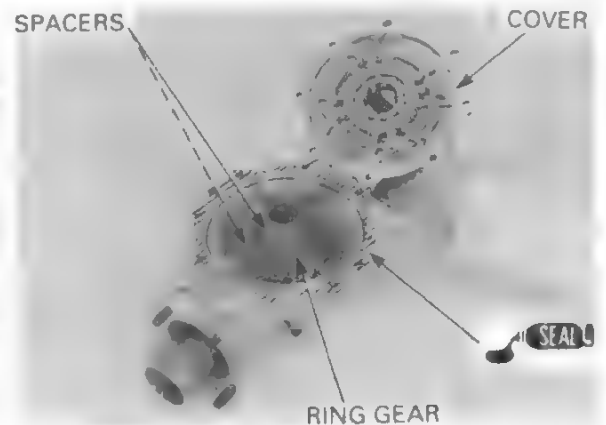
## TORQUE:

10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)

8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)

## CAUTION:

*It is important to turn the pinion while tightening the bolts. If the ring gear spacer is too thick, the gears will lock after only light tightening.*

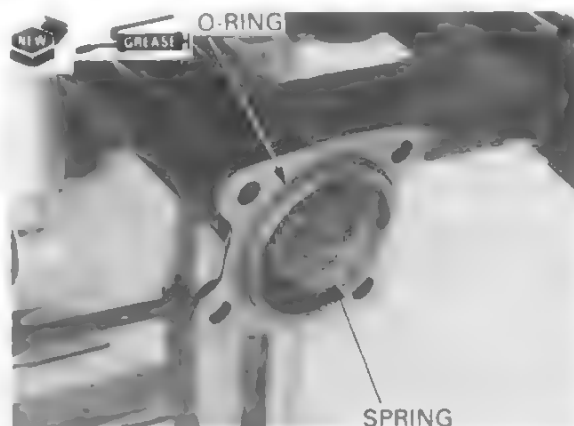


## REAR DRIVING MECHANISM

### GEAR CASE INSTALLATION

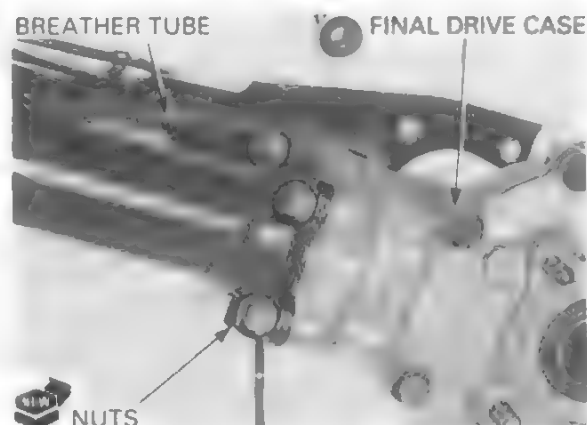
Install a new O-ring on the swingarm.  
Apply grease to the O-ring.

Install the spring in the drive shaft joint.

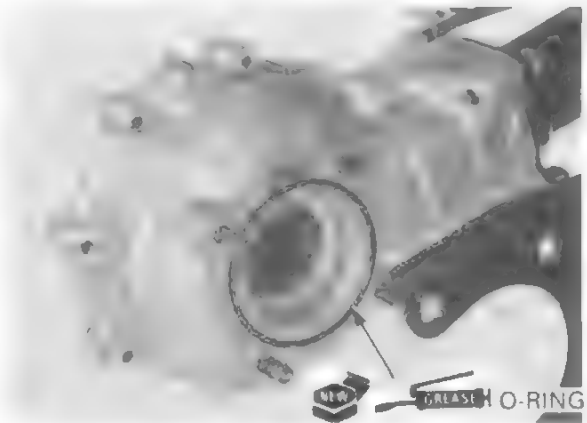


Apply 5 - 8 g of molybdenum disulfide grease to the pinion joint spline.  
Install the final drive case to the swingarm.  
Loosely install the new nuts.  
Do not reuse the nuts.

Connect the breather tube to the case.



Install a new O-ring on the final drive case.  
Apply grease to the O-ring.



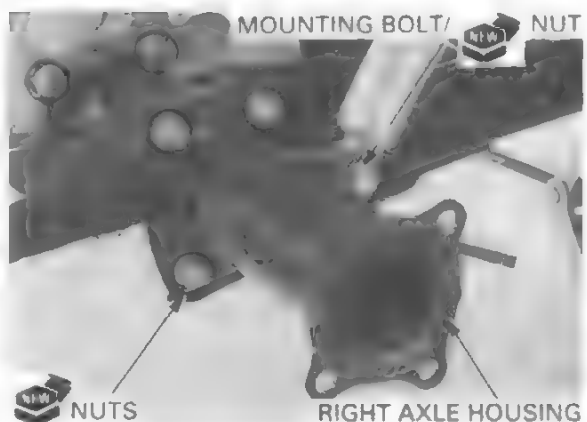
Install the right axle housing to the final drive case  
and install the mounting bolts and new nuts.

Tighten the final drive case joint nuts and axle  
housing nuts to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

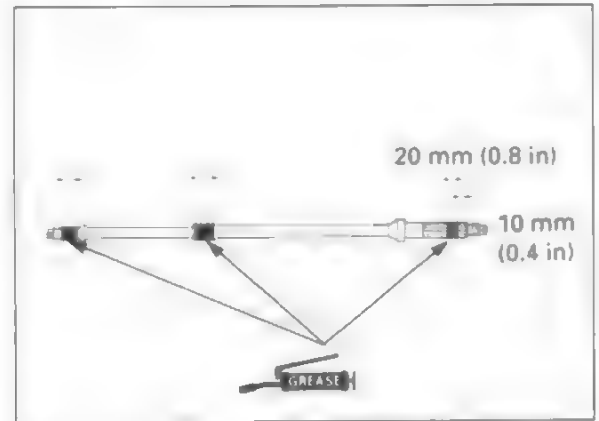
Install the right rear shock absorber lower mounting  
bolt and new nut.  
Tighten the nut to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

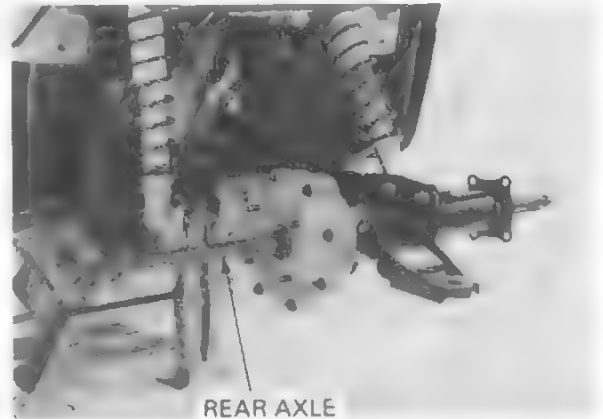


## REAR AXLE INSTALLATION

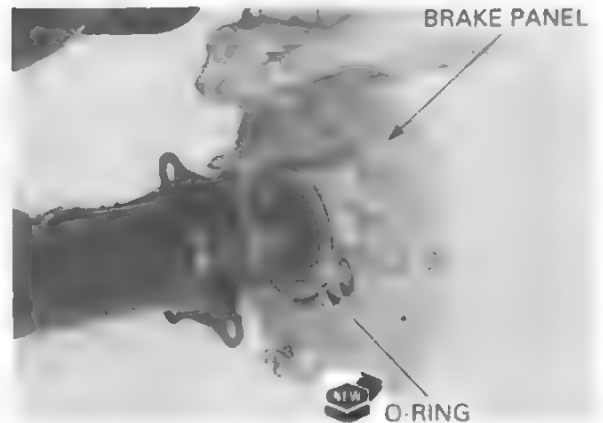
Apply grease to the axle splines.



Install the rear axle from the right side while aligning the splines of the final drive.

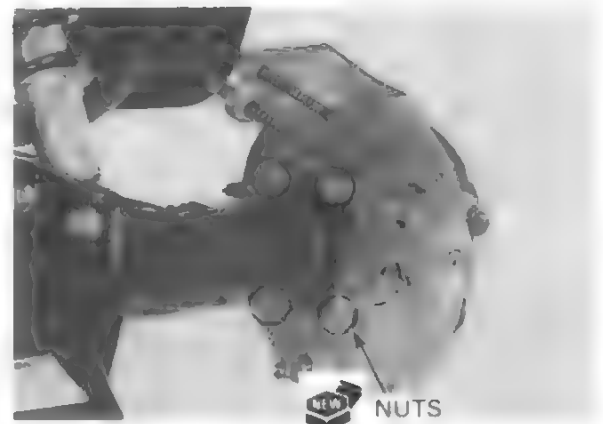


Install a new O-ring on the brake panel.  
Apply grease to the O-ring.



Install and tighten the new brake panel mounting nuts to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**





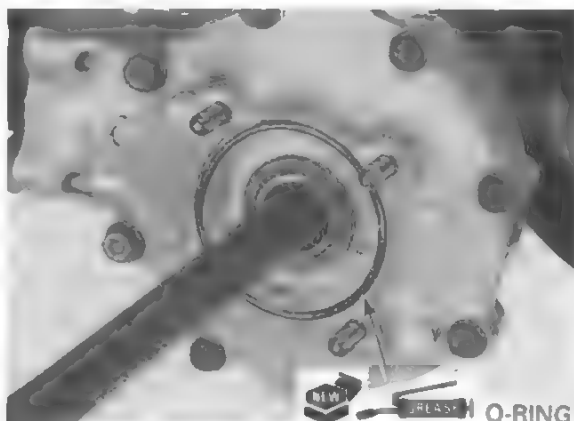
## REAR DRIVING MECHANISM

Install the brake drum and drum cover (page 14-22).

Clean the dust seal mating surface of the wheel hub.  
Apply grease to the axle shaft spline.  
Install the right wheel hub.  
Temporarily tighten the right axle nut.

RIGHT WHEEL HUB

AXLE NUT



Install a new O-ring on the final drive case.  
Apply grease to the O-ring.

Install the collar onto the rear axle.

**NOTE:**

Note the direction of the collar.

REAR AXLE

COLLAR

Install the left axle housing.  
Install the left wheel hub and nut, while centering  
the axle shaft.

LEFT WHEEL HUB

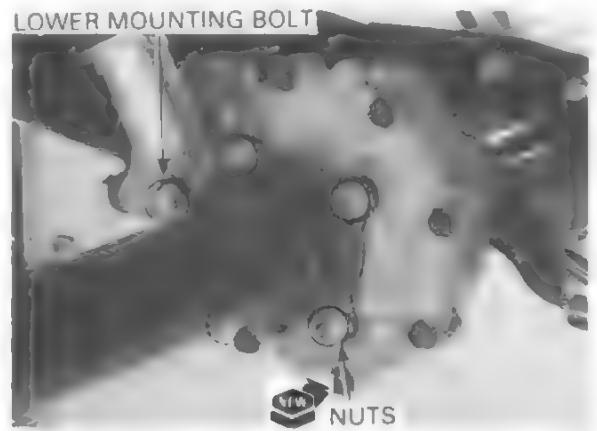
LEFT AXLE HOUSING

Install and tighten the new left axle housing mounting nuts to the specified torque.

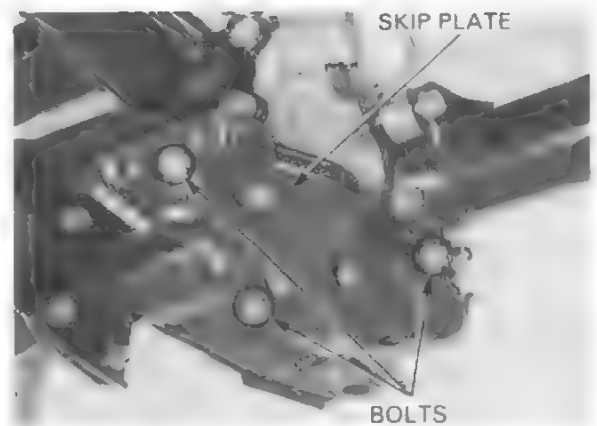
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install and tighten the left rear shock absorber lower mounting bolt.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



Install the final gear case skid plate and tighten the three bolts.



Tighten the axle nuts to the specified torque.

**TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)**

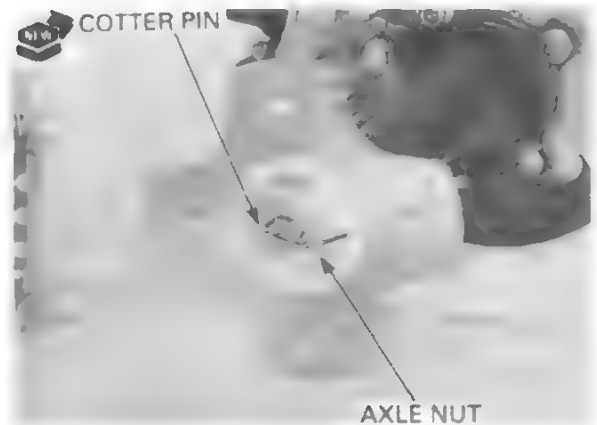
## NOTE:

If cotter pins cannot be installed after torquing nuts due to alignment of axle hole, tighten nut further until cotter pin can be installed. Do not loosen the axle nuts after torquing them to install cotter pins as shown.

Install the new cotter pins.

Install the rear wheels (page 13-3).

Fill the final drive with the recommended oil (page 3-14).

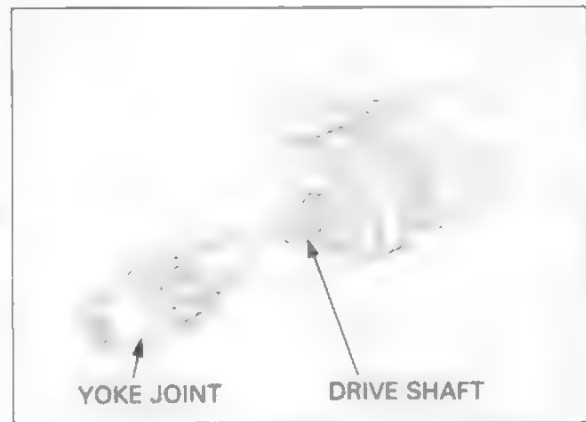


### REAR DRIVE SHAFT

#### REMOVAL

Remove the swingarm (page 13-4).

Pull the yoke joint/drive shaft out of the swingarm and disassemble it.

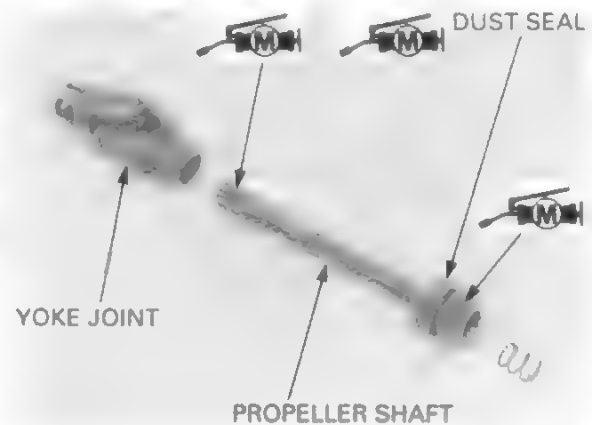


#### INSPECTION

Inspect the yoke joint bearings for excessive play or damage.

Apply molybdenum disulfide grease to the spline.

Apply 5 - 8 g of molybdenum disulfide grease to the spline.

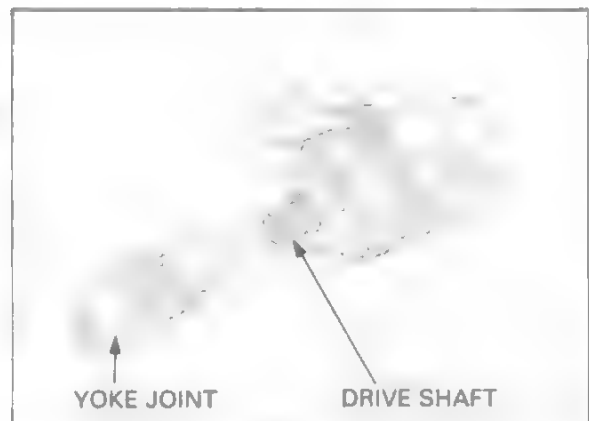


#### INSTALLATION

Assemble the yoke joint and drive shaft.

Install the yoke joint/drive shaft into the swingarm.

Install the swingarm (page 13-7).



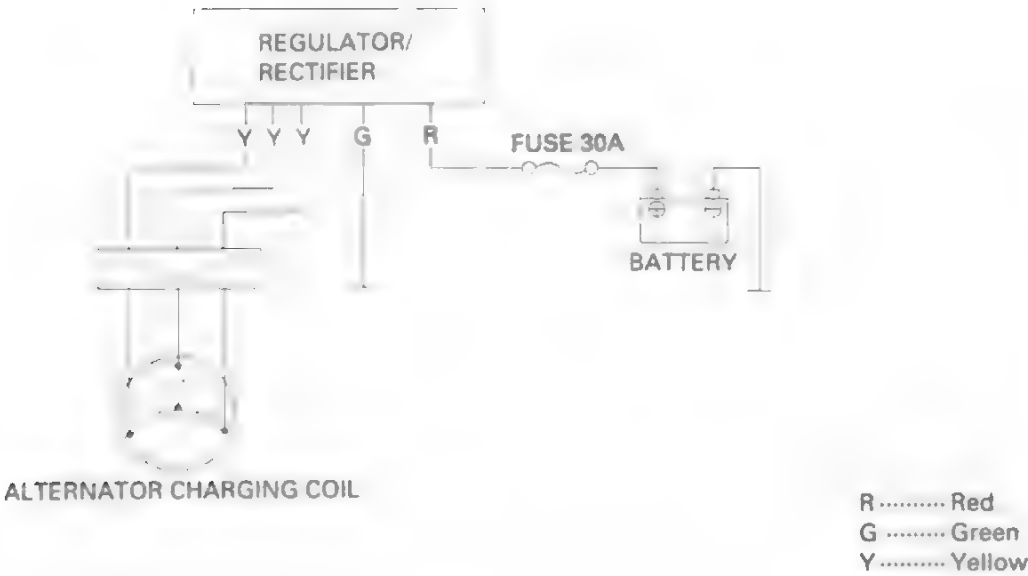
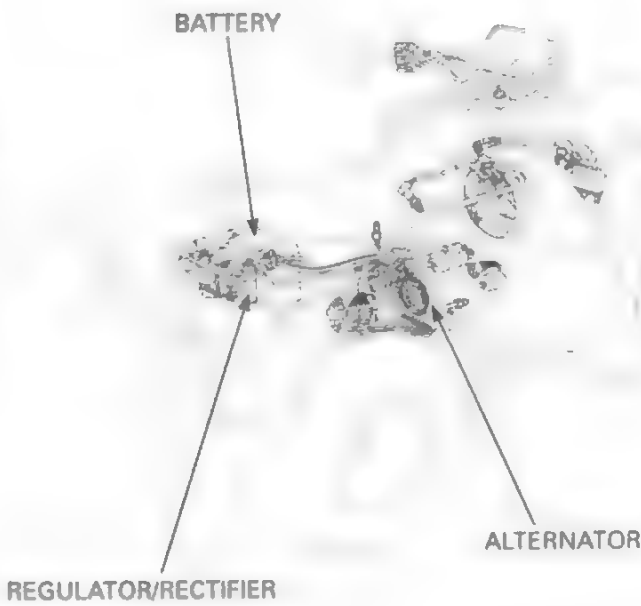
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MEMO

BATTERY/CHARGING SYSTEM

TRX450S/FM:

TRX450ES/FE



# 17. BATTERY/CHARGING SYSTEM

SYSTEM DIAGRAM	17-0	CHARGING SYSTEM INSPECTION	17-8
SERVICE INFORMATION	17-1	ALTERNATOR CHARGING COIL	17-10
TROUBLESHOOTING	17-3	REGULATOR/RECTIFIER	17-11
BATTERY	17-5		

## SERVICE INFORMATION

### GENERAL

#### WARNING

- The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging.
- The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.
  - If electrolyte gets on your skin, flush with water.
  - If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.
- Electrolyte is poisonous.
  - If swallowed, drink large quantities of water or milk and call a physician immediately.

- Always turn off the ignition switch before disconnecting any electrical component.

#### CAUTION:

*Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.*

- For extended storage, remove the battery, give it a full charge, and store it in a cool, dry space. For maximum service life, charge the stored battery every two weeks.
- For a battery remaining in a stored vehicle, disconnect the negative battery cable from the battery terminal.

#### NOTE:

The maintenance free battery must be replaced when it reaches the end of its service life.

#### CAUTION:

*The battery caps should not be removed. Attempting to remove the sealing caps from the cells may damage the battery.*

- The battery can be damaged if overcharged or undercharged, or if left to discharge for long period. These same conditions contribute to shortening the "life span" of the battery. Even under normal use, the performance of the battery deteriorates after 2–3 years.
- Battery voltage may recover after battery charging, but under heavy load, battery voltage will drop quickly and eventually die out. For this reason, the charging system is often suspected as the problem. Battery overcharge often results from problems in the battery itself, which may appear to be an overcharging symptom. If one of the battery cells is shorted and battery voltage does not increase, the regulator-rectifier supplies excess voltage to the battery. Under these conditions, the electrolyte level goes down quickly.
- Before troubleshooting the charging system, check for proper use and maintenance of the battery. Check if the battery is frequently under heavy load, such as having the headlight and taillight ON for long periods of time without riding the vehicle.

## BATTERY/CHARGING SYSTEM

- The battery will self-discharge when the vehicle is not in use. For this reason, charge the battery every 2 weeks to prevent sulfation from occurring.
- Filling a new battery with electrolyte will produce some voltage, but in order to achieve its maximum performance always charge the battery. Also, the battery life is lengthened when it is initially charged.
- When checking the charging system, always follow the steps in the troubleshooting flow chart (page 17-3).

### Battery charging

This model comes with a maintenance-free (MF) battery. Remember the following about MF batteries.

- Use only the electrolyte that comes with the battery
- Use all of the electrolyte
- Seal the battery properly
- Never open the seals again

### CAUTION:

*For battery charging, do not exceed the charging current and time specified on the battery. Use of excessive current or charging time may damage the battery.*

### BATTERY TESTING

Refer to the battery tester's Operation Manual for the recommended battery testing procedure.

The recommended battery tester puts a "load" on the battery so the actual battery condition of the load can be measured.

Recommended battery tester

BM-210-AH, BM-210 or BATTERY MATE

## SPECIFICATIONS

ITEM			SPECIFICATIONS
Battery	Capacity		12 V – 12 AH
	Current leakage		5 mA max.
	Voltage (20°C/68°F)	Fully charged	13.0 – 13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.2 A/5 – 10 h
		Quick	5.0 A/1.0 h
Alternator	Capacity	'98 – '01	0.310 kw/5,000 rpm
		After '01	0.326 kw/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω
	Regulator/rectifier regulated voltage		14.7 – 15.5 V at 5,000 rpm

## TROUBLESHOOTING

## BATTERY IS DAMAGED OR HAS LOW POWER

Remove the battery (page 17-5).  
Check the battery condition using the recommended battery tester.

**RECOMMENDED BATTERY TESTER:**  
BM-210-AH, BM-210 or BATTERY MATE or equivalent

Incorrect → • Faulty battery

Correct

Install the battery (page 17-5).  
Check the battery current leakage (Leak test; page 17-9).

Incorrect

Disconnect the regulator/rectifier connector and recheck the battery current leakage.

Correct

Incorrect

- Shorted wire harness
- Faulty ignition switch

• Faulty regulator/rectifier

Correct

Check the alternator charging coil (page 17-10).

**STANDARD: 0.2 – 0.6  $\Omega$  (20°C/68°F)**

Incorrect → • Faulty charging coil

Correct

Measure and record the battery voltage using a digital multimeter (page 17-5).  
Start the engine.  
Measure the charging voltage (page 17-8).  
Compare the measurement to the result of the following calculation.

Correct → • Faulty battery

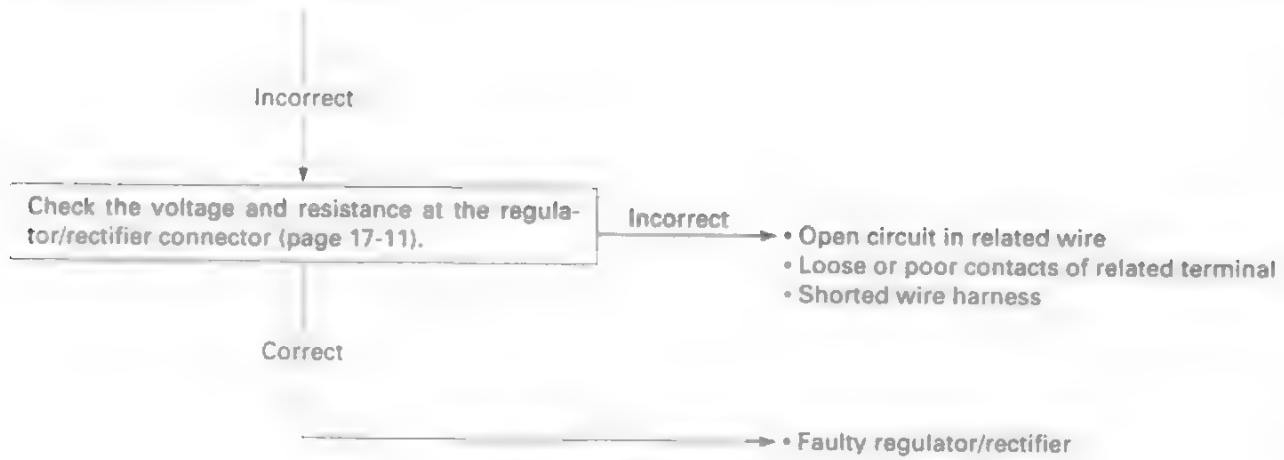
**STANDARD:**  
Measured battery voltage < Matured charging voltage < 15.5V

Incorrect



## BATTERY/CHARGING SYSTEM

---



## BATTERY

### REMOVAL/INSTALLATION

Remove the seat (page 2-3).

Remove the two bolts and battery holder bracket. Disconnect the negative cable and then the positive cable, and remove the battery.

Install the battery in the reverse order of removal with the proper wiring as shown.

#### NOTE:

Connect the positive terminal first and then the negative cable.

After installing the battery, coat the terminals with clean grease.  
Reinstall the removed parts.

### VOLTAGE INSPECTION

Measure the battery voltage using a digital multimeter.

#### VOLTAGE:

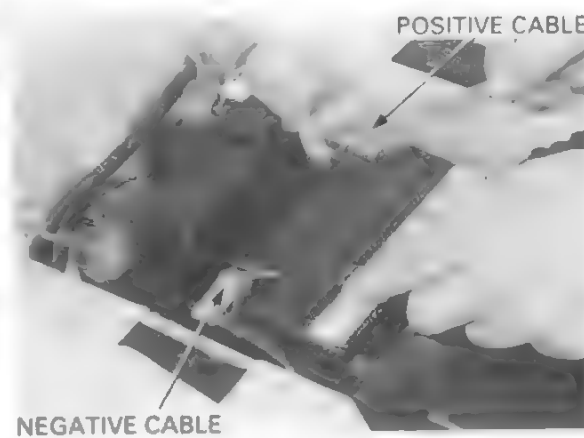
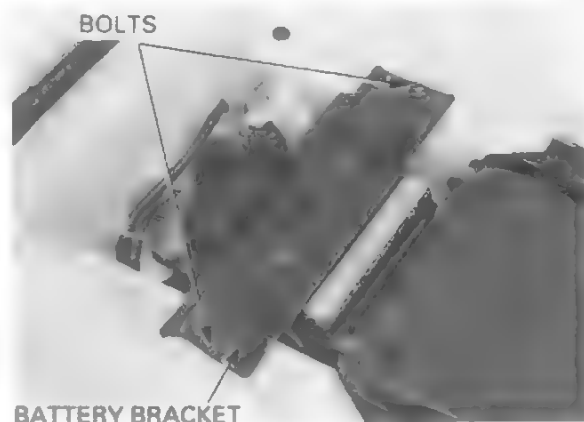
Fully charged: 13.0 – 13.2 V

Under charged: Below 12.3 V

#### TOOL:

Digital multimeter

Commercially available



### BATTERY TESTING

- Always clear the work area of flammable materials such as gasoline, brake fluid, electrolyte, or cloth towels when operating the tester, the heat generated by the tester may cause a fire.

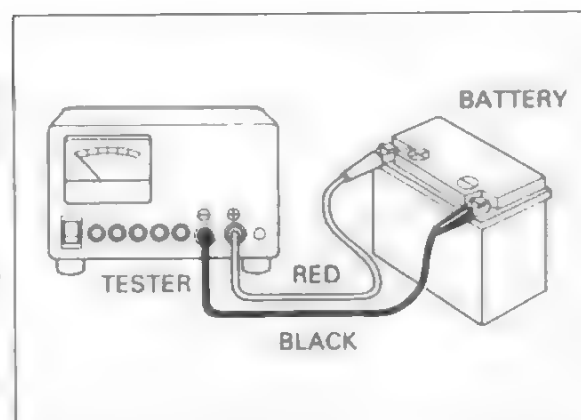
Remove the battery.

Securely connect the tester's positive (+) cable first, then connect the negative (-) cable.

#### TOOL:

Battery tester

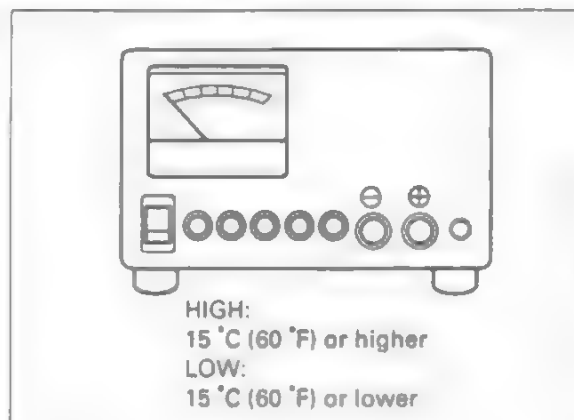
BM-210-AH or BM-210  
(U.S.A. only)



## BATTERY/CHARGING SYSTEM

*For accurate test results, be sure the tester's cables and clamps are in good working condition and that a secure connection can be made at the battery.*

Set the temperature switch to "HIGH" or "LOW" depending on the ambient temperature.



*For the first check, Do NOT charge the battery before testing, test it in an "as is" condition.*

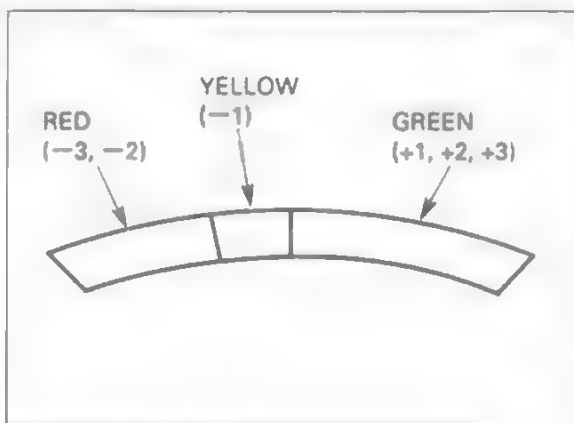
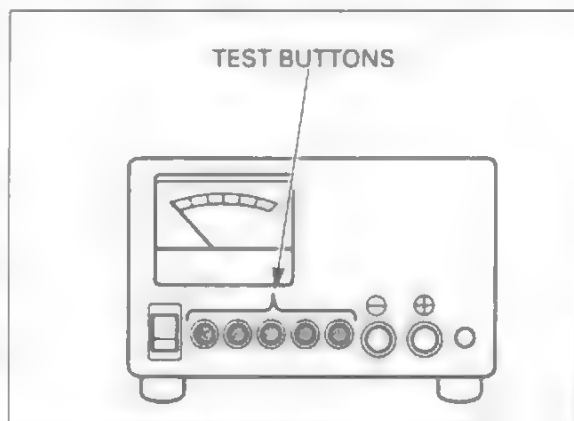
Push in the appropriate test button for 3 seconds and read the condition of the battery on the meter.

To avoid damaging the tester, only test batteries with an amperage rating of less than 30 Ah.

Tester damage can result from overheating when:

- The test button is pushed in for more than 3 seconds.
- The tester is used without being allowed to cool for at least 1 minute when testing more than one battery.
- More than ten consecutive tests are performed without allowing at least a 30-minute cool-down period.

The result of a test on the meter scale is relative to the amp. hour rating of the battery. ANY BATTERY READING IN THE GREEN ZONE IS OK. Batteries should only be charged if they register in the YELLOW or RED zone.



## BATTERY CHARGING

Remove the battery (page 17-5).

- Clean the battery terminals and position the battery as far away from the charger as the leads will permit.
- Do not place batteries below the charger - gases from the battery may corrode and damage the charger.
- Do not place batteries on top of the charger. Be sure the air vents are not blocked.

## TOOL:

Christie battery charger MC1012/2 (U.S.A. only)

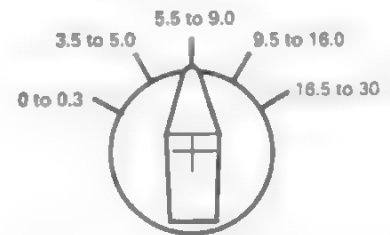
1. Turn the power Switch to the OFF position.
2. Set the battery Amp. Hr. selector Switch for the size of the battery being charged.
3. Set the Timer to the position indicated by the Honda Battery Tester; RED - 3, RED - 2 or YELLOW 1.  
If you are charging a new battery, set the switch to the NEW BATT position.
4. Attach the clamps to the battery terminals: RED to Positive, BLACK to Negative.

Connect the battery cables only when the Power Switch is OFF.

*The charger will automatically switch to the "Trickle" mode after the set charging time has elapsed*

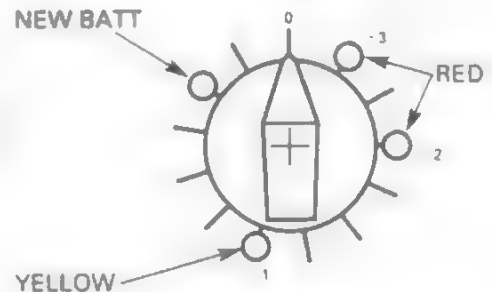
5. Turn the Power Switch to the ON position.
6. When the timer reaches the "Trickle" position, the charging cycle is complete. Turn the Power Switch OFF and disconnect the clamps.
7. Let the battery cool for at least 10 minutes or until gassing subsides after charging.
8. Retest the battery using the Honda Battery Tester and recharge if necessary using the above steps.

## BATTERY AMP HR. SELECTOR SWITCH



Set the appropriate amp. hour rating.

## TIMER Trickle



### CHARGING SYSTEM INSPECTION

#### NOTE:

- When inspecting the charging system, check the system components and lines step-by-step according to the troubleshooting on page 17-3.
- Measuring circuits with a large capacity that exceeds the capacity of the tester may cause damage to the tester. Before starting each test, set the tester at the highest capacity range first, then gradually lower the capacity ranges until you have the correct range.
- When measuring small capacity circuits, keep the ignition switch off. If the switch is suddenly turned on during a test, the tester fuse may blow.

### REGULATED VOLTAGE INSPECTION

#### WARNING

*If the engine must be running to do some work make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in an enclosed area.*

#### NOTE:

Be sure the battery is in good condition before performing this test.

Warm up the engine to normal operating temperature.

Stop the engine, and connect the multimeter as shown.

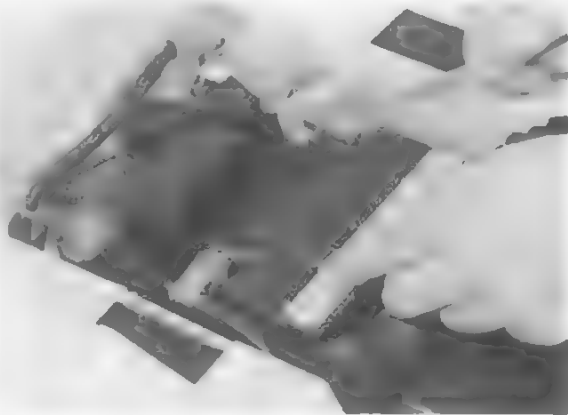
#### CAUTION:

- To prevent a short, make absolutely certain which are the positive and negative terminals or cable.
- Do not disconnect the battery or any cable in the charging system without first switching off the ignition switch. Failure to follow this precaution can damage the tester or electrical components.

Restart the engine.

With the headlight on Hi beam, measure the voltage on the multimeter when the engine runs at 5,000 rpm.

**STANDARD:** 14.7 ~15.5 V at 5,000 rpm



The battery is normal if the specified regulated voltage is displayed on the multimeter.

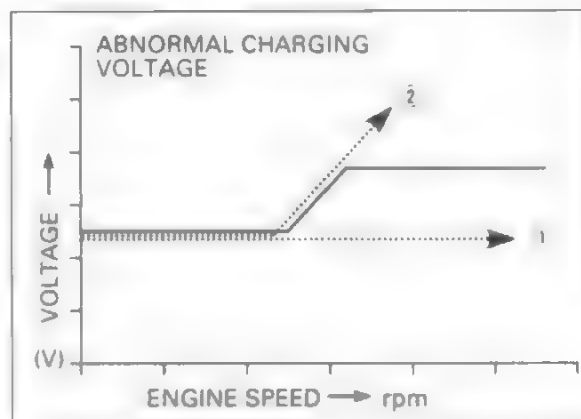
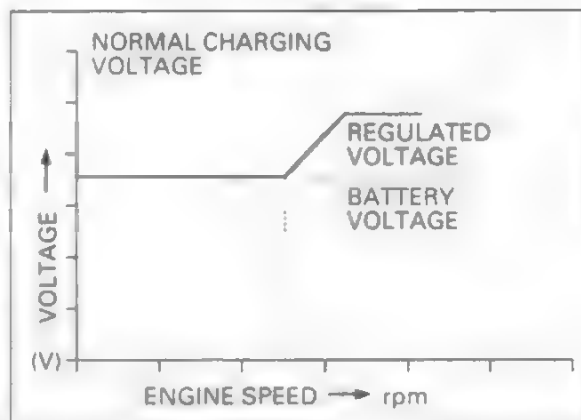
## NOTE:

The speed at which the voltage starts to rise cannot be checked as it varies with the temperature and loads of the generator.

A frequently discharged battery is an indication that it is deteriorated even if it proves normal in the regulated voltage inspection.

The charging circuit may be abnormal if any of the following symptoms is encountered.

- 1 Voltage does not rise to regulated voltage:
  - Open or short circuit in the charging system wire harness or poorly connected connector.
  - Open or short of the alternator.
  - Faulty regulator/rectifier.
- 2 Regulated voltage is too high:
  - Poorly grounded voltage regulator/rectifier.
  - Faulty battery.
  - Faulty regulator/rectifier.

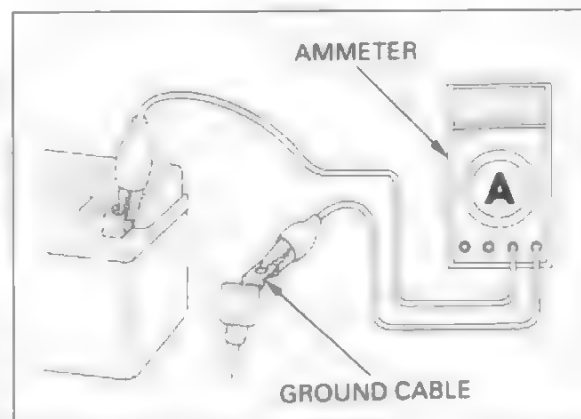


## CURRENT LEAKAGE INSPECTION

Turn the ignition switch off and disconnect the negative battery cable from the battery. Connect the ammeter (+) probe to the ground cable and the ammeter (-) probe to the battery (-) terminal. With the ignition switch off, check for current leakage.

## NOTE:

- When measuring current using a tester, set it to a high range, and then bring the range down to an appropriate level. Current flow higher than the range selected may blow out the fuse in the tester.
- While measuring current, do not turn the ignition on. A sudden surge of current may blow out the fuse in the tester.



## SPECIFIED CURRENT LEAKAGE: 5 mA max.

If current leakage exceeds the specified value, a shorted circuit is likely.

Locate the short by disconnecting connections one by one and measuring the current.

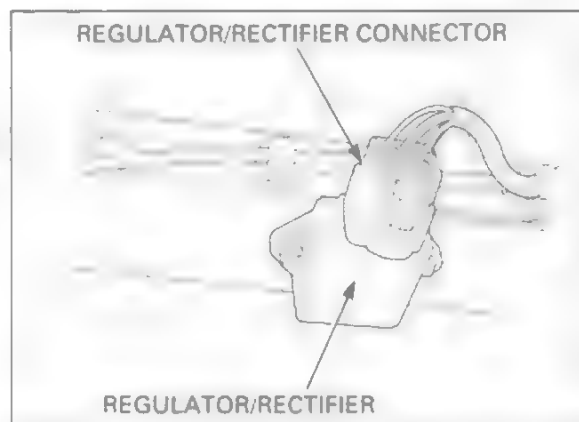
### ALTERNATOR CHARGING COIL

#### NOTE:

It is not necessary to remove the stator coil to make this test.

#### INSPECTION

Disconnect the regulator/rectifier 5P connector.

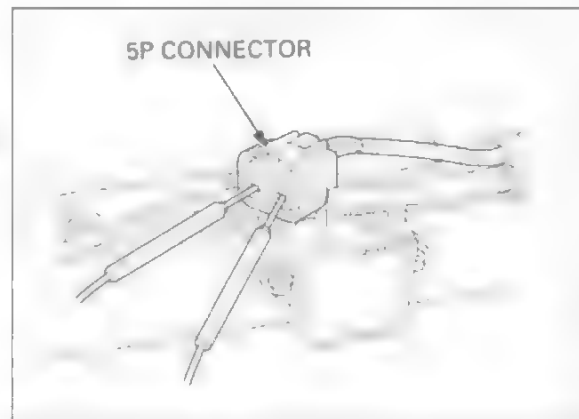


Check the resistance between Yellow terminals.

**STANDARD: 0.1 – 1.0  $\Omega$  (20°C/68°F)**

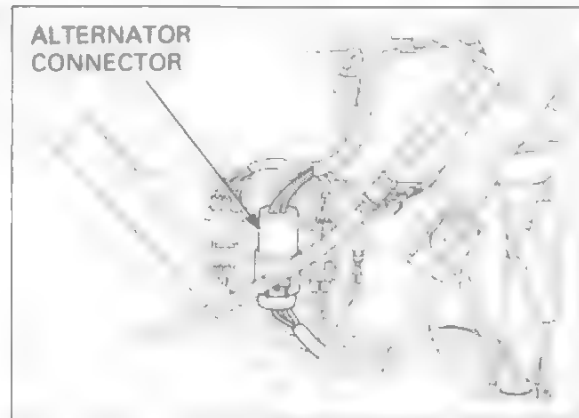
Check for continuity between Yellow terminals and Ground.

There should be no continuity.



If the reading is out of specification check the resistance at the alternator connector.

Disconnect the alternator 5P (Natural) connector.



Check the resistance between Yellow terminals.

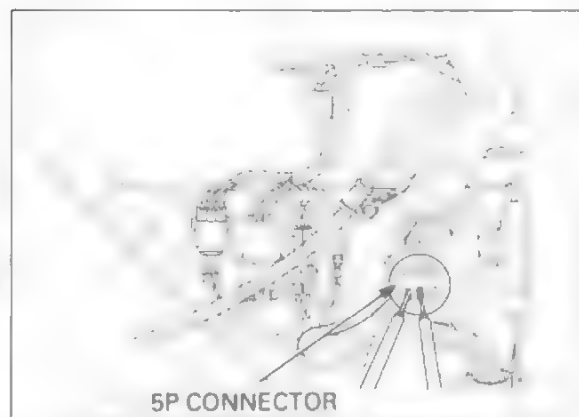
**STANDARD: 0.1 – 1.0  $\Omega$  (20°C/68°F)**

Check for continuity between Yellow terminals and Ground.

There should be no continuity.

If readings are still far beyond the standard, or if any wire has continuity to ground, replace the alternator stator.

Refer to section 10 for stator removal.



## REGULATOR/RECTIFIER

### SYSTEM INSPECTION

Disconnect the regulator/rectifier connector, and check it for loose contact or corroded terminals.

If the regulated voltage reading (see page 17-8) is out of the specification, measure the voltage between connector terminals (wire harness side) as follows:

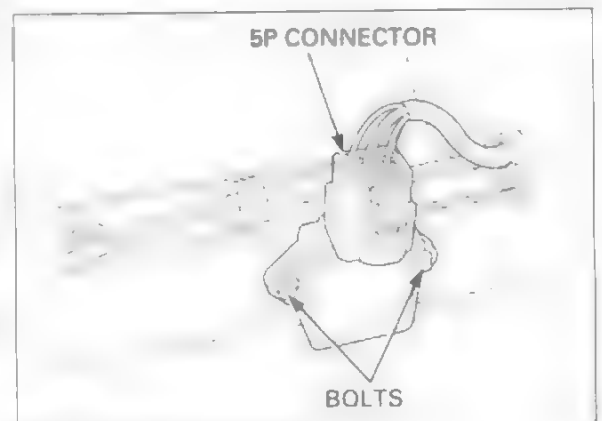
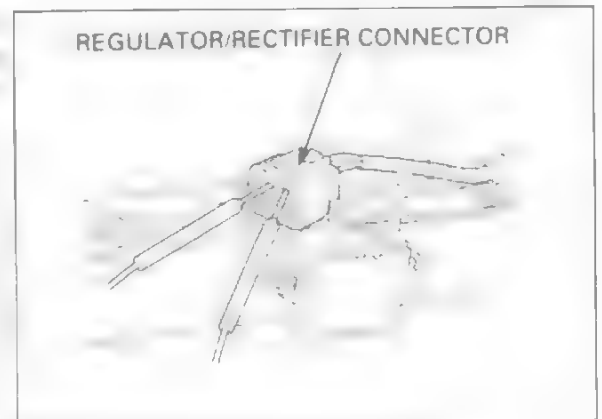
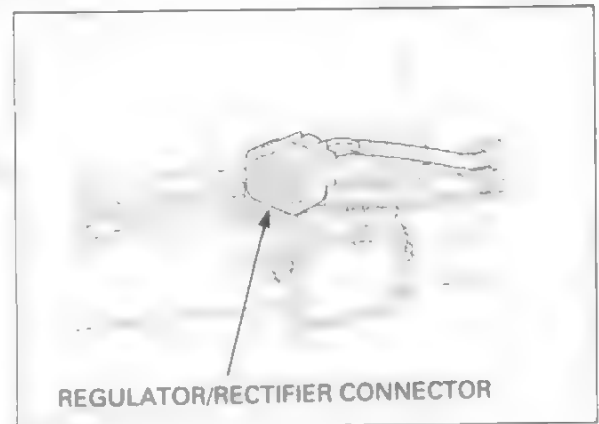
Item	Terminal	Specification
Battery charging line	Red (+) and ground (-)	Battery voltage should register
Charging coil line	Yellow and Yellow	0.1 – 1.0Ω (at 20°C/68°F)
Ground line	Green and ground	Continuity should exist

If all components of the charging system are normal and there are no loose connections at the regulator/rectifier connectors, replace the regulator/rectifier unit.

### REMOVAL/INSTALLATION

Disconnect the connector.  
Remove the regulator/rectifier unit mounting bolts and regulator/rectifier.

Install the regulator/rectifier unit in the reverse order of removal.

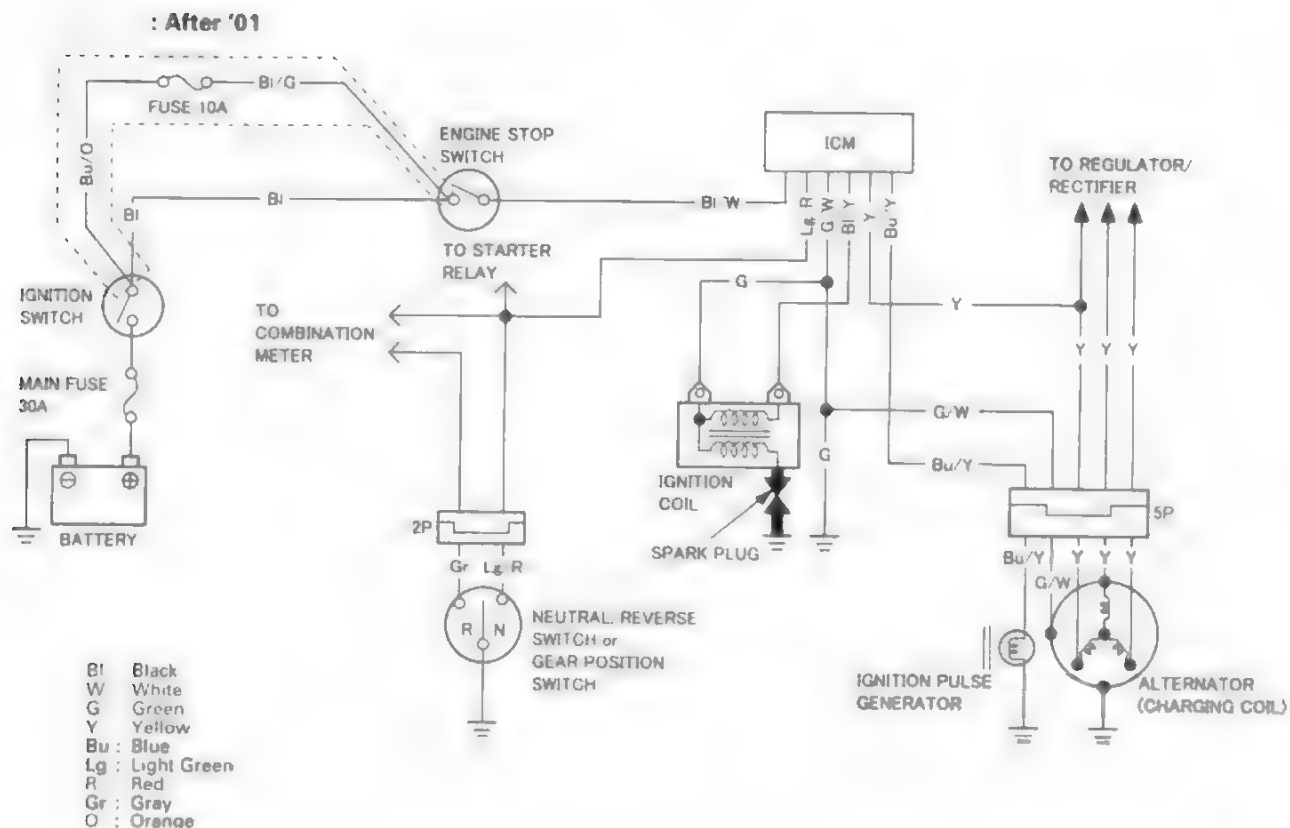
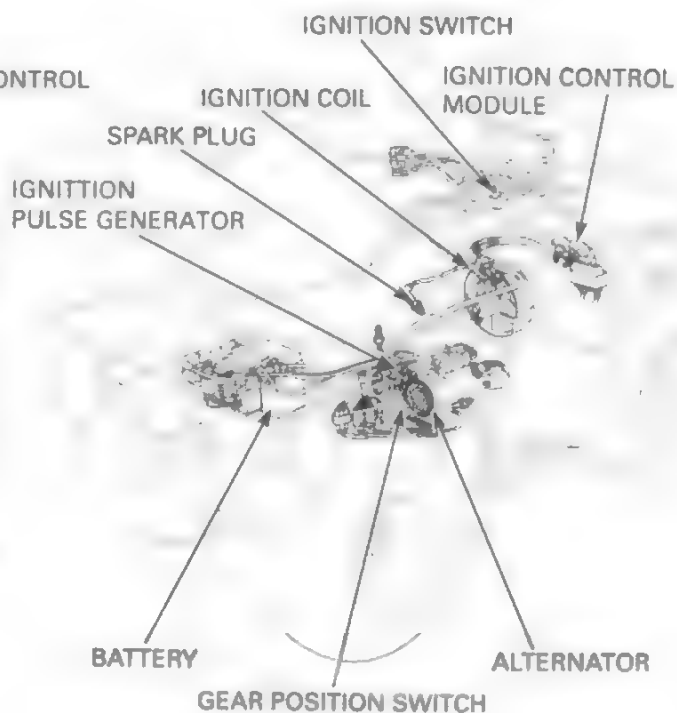
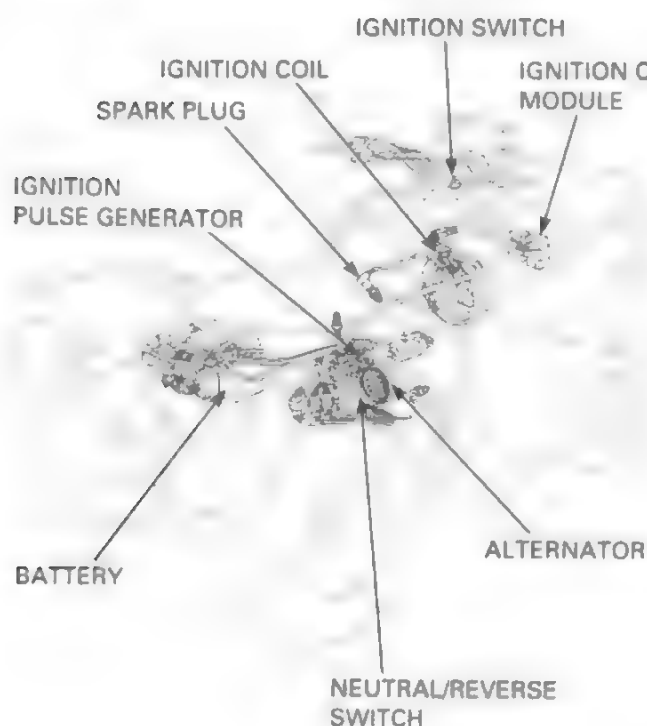




# IGNITION SYSTEM

TRX450S/FM:

TRX450ES/FE



# 18. IGNITION SYSTEM

SYSTEM DIAGRAM	<u>18-0</u>	IGNITION COIL	<u>18-7</u>
SERVICE INFORMATION	<u>18-1</u>	IGNITION PULSE GENERATOR	<u>18-7</u>
TROUBLESHOOTING	<u>18-3</u>	IGNITION TIMING	<u>18-8</u>
IGNITION SYSTEM INSPECTION	<u>18-4</u>		

## SERVICE INFORMATION

### GENERAL

#### WARNING

*If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in an enclosed area.*

#### CAUTION:

*Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is on and current is present.*

- When servicing the ignition system, always follow the steps in the troubleshooting sequence on page 18-3.
- The ignition timing does not normally need to be adjusted since the Ignition Control Module (ICM) is factory preset.
- The ICM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the module. Always turn off the engine stop switch before servicing.
- A faulty ignition system is often related to poor connections. Check those connection before proceeding.
- Use a spark plug of the correct heat range. Using a spark plug with an incorrect heat range can damage the engine.

### SPECIFICATIONS

ITEM		SPECIFICATIONS	
Spark plug	Standard	DPR7EA-9 (NGK)	X22EPR U9 (DENSO)
	For cold climate (below 5 C, 41 F)	DPR6EA-9 (NGK)	X20EPR-U9 (DENSO)
	For extended high speed riding	DPR8EA-9 (NGK)	X24EPR-U9 (DENSO)
Spark plug gap		0.8 – 0.9 mm (0.03 – 0.04 in)	
Ignition coil peak voltage		100 V minimum	
Ignition pulse generator peak voltage		0.7 V minimum	
Ignition timing	"F" mark	10° BTDC at 1,400 rpm	
	Full advance	30° BTDC at 5,900 rpm	

## IGNITION SYSTEM

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### TORQUE VALUE

Spark plug	18 N•m (1.8 kg•m, 13 lb•ft)
Timing hole cap	10 N•m (1.0 kg•m, 7 lb•ft)
Ignition pulse generator socket bolt	6 N•m (0.6 kg•m, 4.3 lb•ft)    Apply a locking agent

### TOOLS

Peak voltage tester (U. S. A. only) or Peak voltage adaptor	07HGJ-0020100 (not available in U. S. A.) with commercially available digital multimeter (impedance 10 M $\Omega$ /DCV minimum)
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## TROUBLESHOOTING

- Inspect the following before diagnosing the system:
  - Faulty spark plug
  - Loose spark plug cap or spark plug wire connection
  - Water got into the spark plug cap (leaking the ignition coil secondary voltage)
- Temporarily exchange the ignition coil with another one and perform the spark test. If there is spark, the original ignition coil is faulty.
- Before starting troubleshooting, disconnect the alternator 5P connector, and check continuity between the Yellow (ICM connector on the wire harness side) and Yellow on the wire harness side of the alternator connector.

### No spark at plug

Unusual condition		Probable cause (Check in numerical order)
Ignition coil primary voltage	Low peak voltage	1. The multimeter impedance is too low. 2. Cranking speed is too low. 3. The sampling time of the tester and measured pulse were not synchronized (System is normal if measured voltage is over the standard voltage at least once). 4. Poor connection or an open circuit in ignition system. 5. Faulty ignition pulse generator (Measure the peak voltage). 6. Faulty ICM (If 1 – 5 above are normal).
	No peak voltage	1. Incorrect peak voltage adaptor connections. 2. Faulty ignition switch or engine stop switch. 3. Loose or poorly connected ICM connector. 4. Open circuit or poor connection in ground wire of the ICM. 5. Faulty peak voltage adaptor, or peak voltage tester. 6. Faulty ignition pulse generator or (measure the peak voltage). 7. Faulty ICM (If 1 – 6 above are normal).
	Peak voltage is normal, but no spark jumps at plug.	1. Faulty spark plug or leaking ignition coil secondary current. 2. Faulty ignition coil.
Ignition pulse generator	Low peak voltage	1. The multimeter impedance is too low; below 10M $\Omega$ /DCV. 2. Cranking speed is too low. 3. The sampling timing of the tester and measured pulse were not synchronized (system is normal if measured voltage is over the standard voltage at least once). 4. Faulty ignition pulse generator (If 1 – 3 above are normal).
	No peak voltage	1. Faulty peak voltage adaptor or peak voltage tester. 2. Faulty ignition pulse generator.

### IGNITION SYSTEM INSPECTION

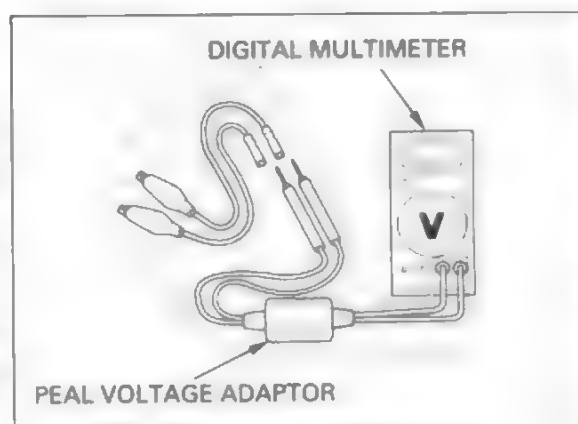
#### NOTE:

- If there is no spark at plug, check all connections for loose or poor contact before measuring each peak voltage.
- Use recommended digital multimeter or commercially available digital multimeter with an impedance of 10 M $\Omega$ /DCV minimum.
- The display value differs depending upon the internal impedance of the multimeter.
- If using peak voltage tester (U.S.A. only), follow the manufacture's instructions.

Connect the peak voltage adaptor to the digital multimeter, or use the peak voltage tester (U.S.A. only).

#### TOOLS:

Peak voltage tester (U.S.A. only) or  
Peak voltage adaptor 07HGJ-0020100  
(not available in U.S.A.) with commercially available  
digital multimeter (impedance 10 M $\Omega$ /DCV minimum)



### IGNITION COIL PRIMARY PEAK VOLTAGE

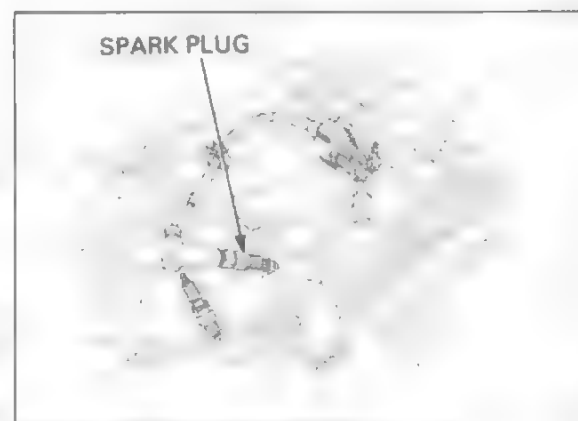
#### ⚠ WARNING

*Avoid touching the spark plug and tester probes to prevent electric shock.*

#### NOTE:

- Check all system connections before inspection. If the system is disconnected, incorrect peak voltage might be measured.
- Check cylinder compression and check that the spark plug is installed correctly.

Shift the transmission into neutral and disconnect the spark plug cap from the spark plug. Connect a known good spark plug to the spark plug cap and ground the spark plug to the cylinder.



With the ignition coil primary wire connected, connect the peak voltage adaptor or peak voltage tester to the ignition coil.

## CONNECTION:

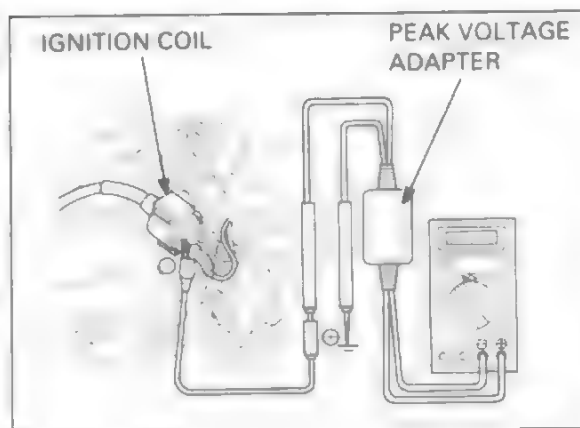
**Black/Yellow terminal (-) – Body ground (+)**

Turn the engine stop switch to "RUN"

Crank the engine with the starter motor and read ignition coil primary peak voltage.

**PEAK VOLTAGE: 100 V minimum**

If the peak voltage is abnormal, check for an open circuit or poor connection in Black/Yellow wire. If no defects are found in the harness, refer to the troubleshooting chart on page 18-3.



## IGNITION PULSE GENERATOR PEAK VOLTAGE

### NOTE:

Check cylinder compression and check that the spark plug is installed correctly.

Disconnect the 4P connector from the ICM. Connect the peak voltage adaptor or peak voltage tester probes to the connector terminals of the wire harness side.

### TOOLS:

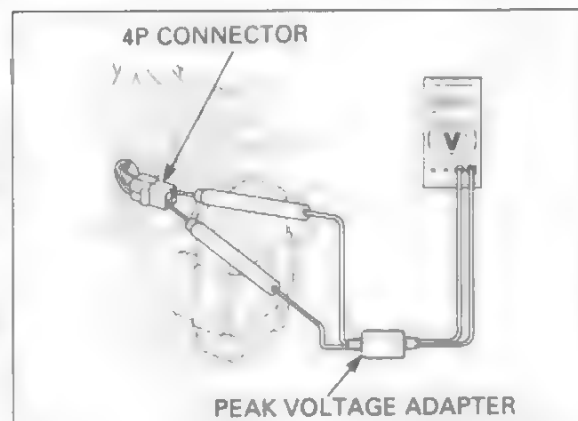
Peak voltage tester (U.S.A. only) or  
Peak voltage adaptor 07HGJ-0020100  
(not available in U.S.A.) with commercially available  
digital multimeter (impedance 10  $\Omega$ /DCV minimum)

### CONNECTION:

**Blue/Yellow terminal (+) – Green/White (-)**

Crank the engine with the starter motor and read the peak voltage.

**PEAK VOLTAGE: 0.7 V minimum**



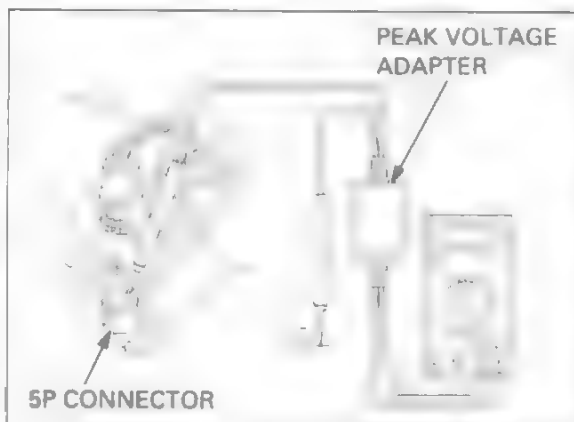
## IGNITION SYSTEM

If the peak voltage measured at ICM connector is abnormal, measure the peak voltage at the pulse generator connector.

Disconnect the ignition pulse generator connector and connect the tester probes to the terminal (Blue/Yellow and Ground).

In the same manner as at the ICM connector, measure the peak voltage and compare it to the voltage measured at the ICM connector.

- If the peak voltage measured at the ICM is abnormal and the one measured at the ignition pulse generator is normal, the wire harness has an open circuit or loose connection.
- If both peak voltages measured are abnormal, check each item in the troubleshooting chart on page 18-3. If all items are normal, the ignition pulse generator is faulty. See page 18-7 for ignition pulse generator replacement.



## AC SENSOR LINE

### INSPECTION

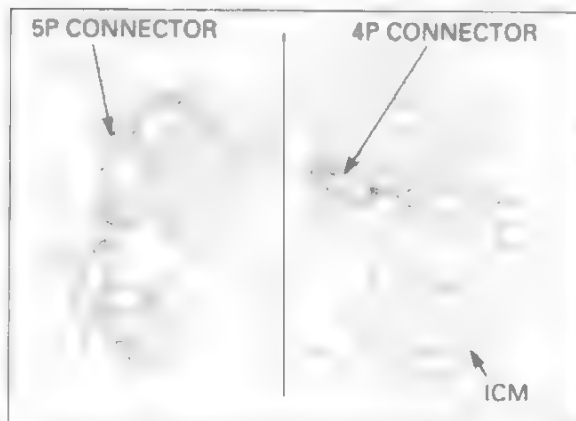
#### NOTE:

It is not necessary to remove the stator coil to make this test.

Disconnect the ICM 4P connector and alternator 5P connector.

Check for continuity between connector terminals as below.

	ICM 4P connector Yellow terminal
Alternator 5P connector Yellow terminal	Continuity
Alternator 5P connector Green terminal	No continuity



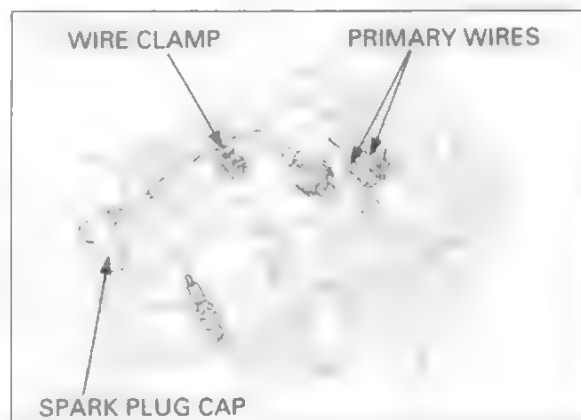
## IGNITION COIL

### REMOVAL/INSTALLATION

Remove the fuel tank and heat guard (page 5-20).

Disconnect the spark plug cap from the plug.  
Release the spark plug wire from the clamp.  
Disconnect the primary wires from the ignition coil.  
Remove the ignition coil.

Installation is in the reverse order of removal.

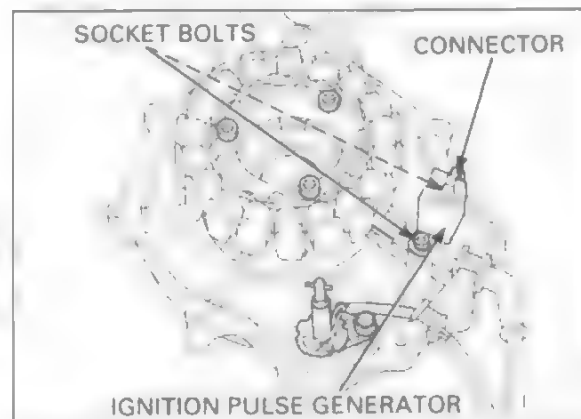


## IGNITION PULSE GENERATOR

### REMOVAL

Remove the alternator cover (page 10-6)

Disconnect the ignition pulse generator connector and release the wire from the ignition pulse generator body groove.  
Remove the socket bolts and ignition pulse generator.



### INSTALLATION

Install the ignition pulse generator onto the alternator cover.

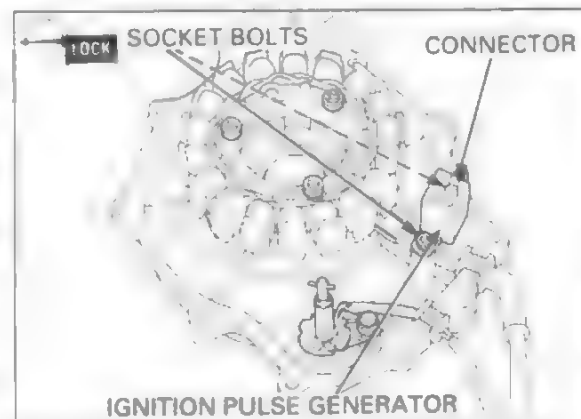
Apply a locking agent to the ignition pulse generator socket bolt threads.  
Install and tighten the socket bolts to the specified torque.

**TORQUE:** 6 N·m (0.6 kgf·m , 4.3 lbf·ft)

Apply sealant to the ignition pulse generator grommet.

Install the ignition pulse generator grommet into the groove of the body securely.

Install the alternator cover (page 10-14).





### IGNITION TIMING

#### **⚠ WARNING**

*If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and may lead to death. Run the engine in an open area or with an exhaust evacuation system in an enclosed area.*

Warm up the engine.  
Stop the engine and remove the timing hole cap.

*Read the instructions for timing light operation.*

Connect the timing light to the spark plug wire.

Start the engine and let it idle.

**IDLE SPEED: 1,400 ± 100 rpm**

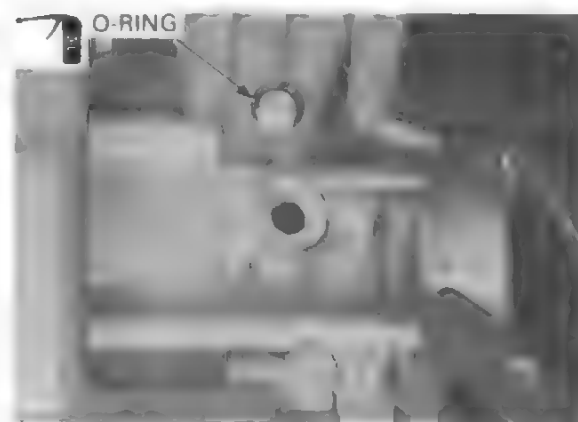
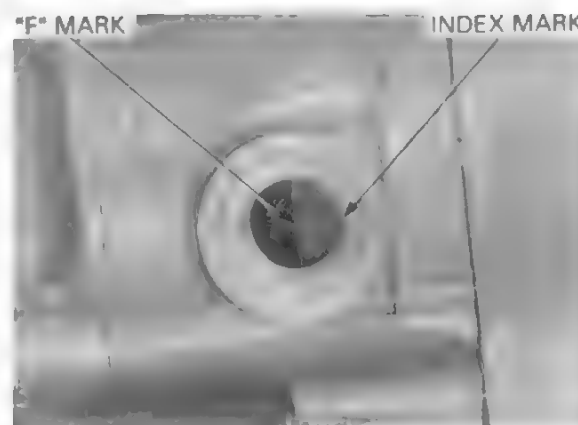
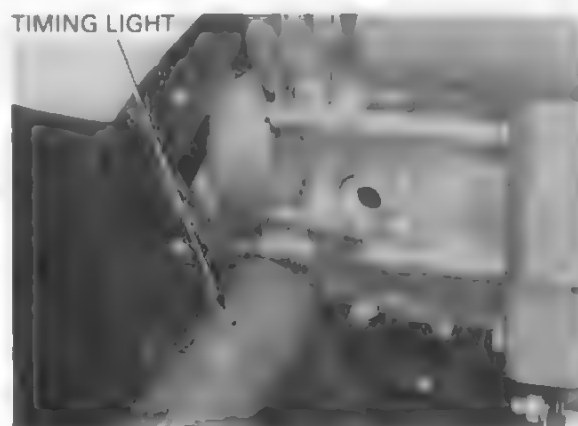
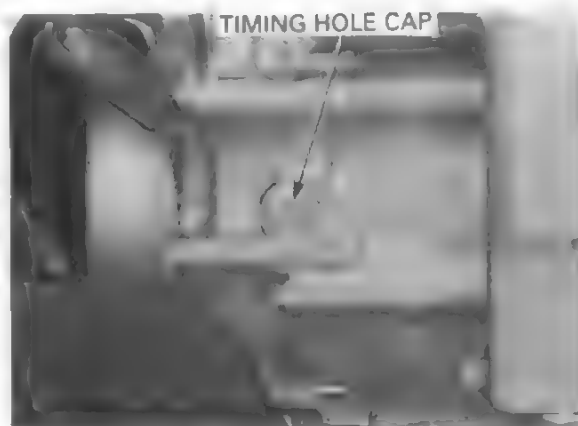
The ignition timing is correct if the "F" mark aligns with the index notch on the left crankcase.

Increase the engine speed by turning the throttle stop screw and make sure the "F" mark begins to move.

Check that the O-ring is in good condition, replace if necessary.

Apply oil to the O-ring and install and tighten the timing hole cap.

**TORQUE: 10 N·m (1.0 kgf·m , 7 lbf·ft)**

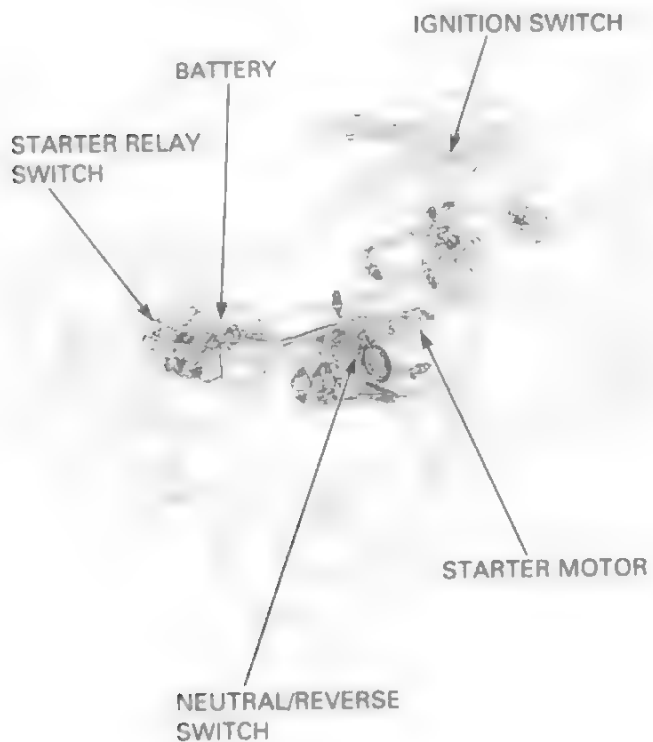


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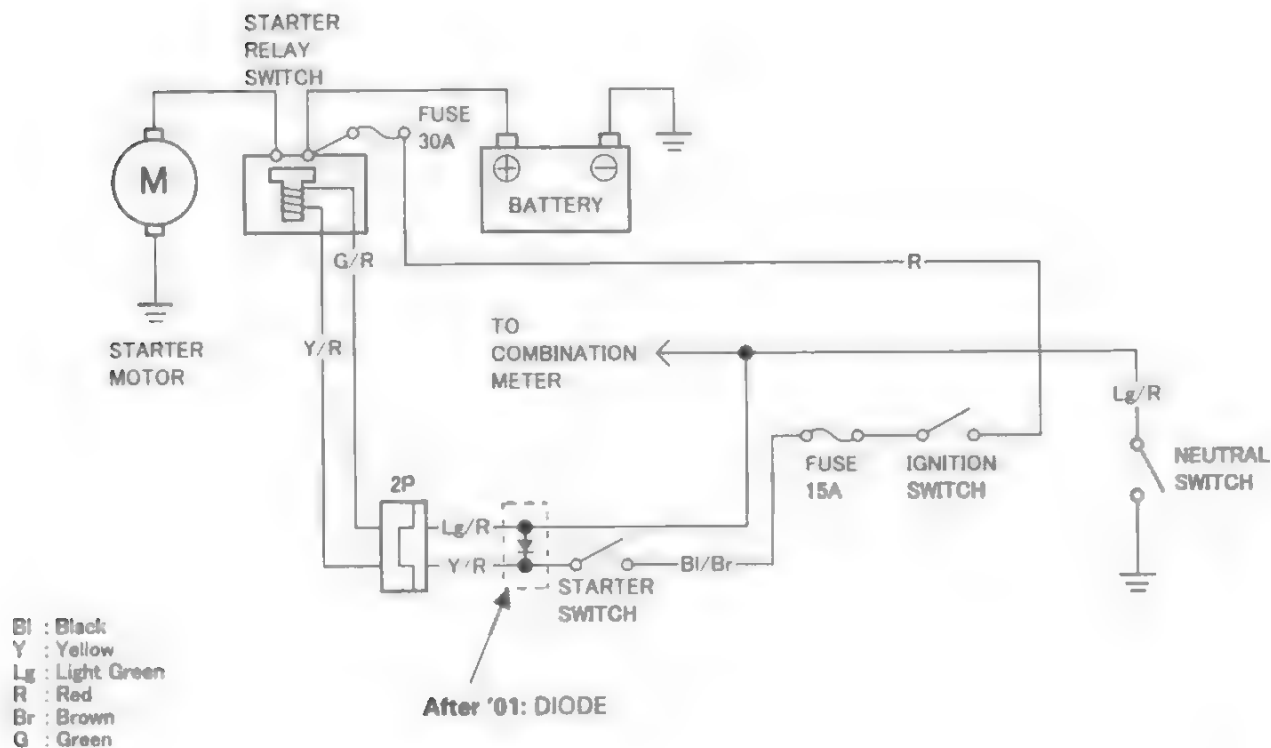
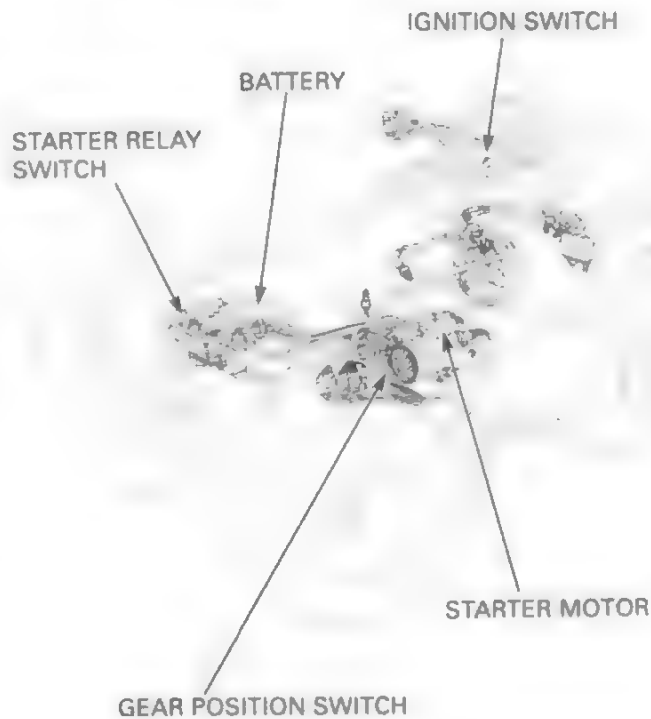
MEMO

# ELECTRIC STARTER

TRX450S/FM:



TRX450ES/FE



# 19. ELECTRIC STARTER

SYSTEM DIAGRAM	19-0	STARTER MOTOR	19-3
SERVICE INFORMATION	19-1	STARTER RELAY SWITCH	19-7
TROUBLESHOOTING	19-2		

## SERVICE INFORMATION

### GENERAL

- The starter motor can be removed with the engine in the frame.
- For the starter reduction gear removal/installation, see section 10.

### SPECIFICATIONS

Unit: mm (in)

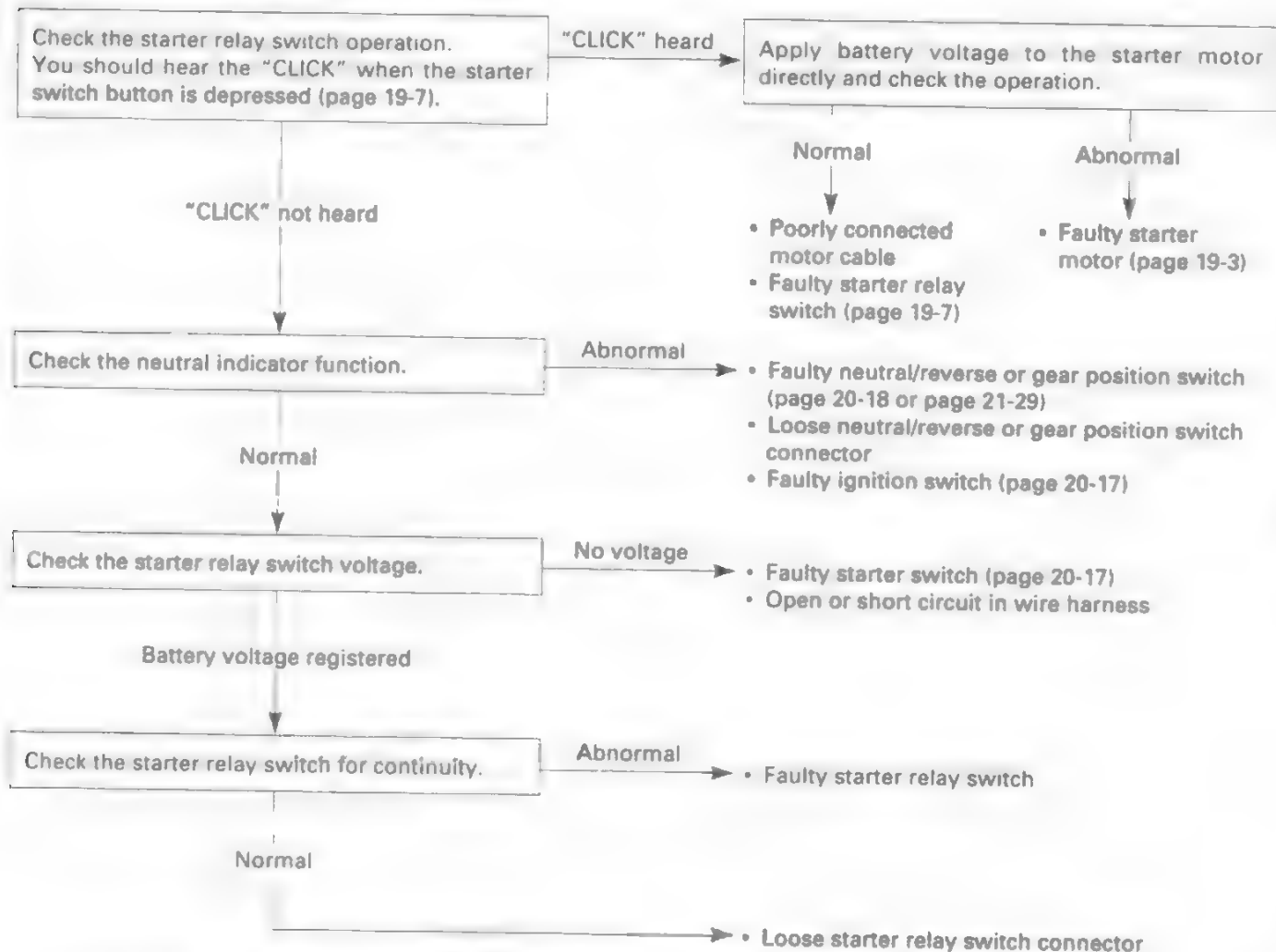
ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.5 (0.49)	9.0 (0.35)

### TROUBLESHOOTING

#### NOTE:

- The starter motor should operate only when the transmission is in neutral.
- Check the following items before troubleshooting the system.
  - Blown fuse (15A)
  - Battery and starter motor cables for loose connection
  - Battery discharged

#### Starter motor does not turn



#### Starter motor turns engine slowly

- Low battery voltage
- Excessive resistance in circuit
- Binding in starter motor

#### Starter motor turns, but engine does not turn

- Faulty starter clutch (see section 10)
- Faulty starter reduction gears (see section 10)

#### Starter motor and engine turns, but engine does not start

- Faulty ignition system (see section 18)
- Engine problems (see section 3,7)
  - Low compression
  - Fouled spark plug

## STARTER MOTOR

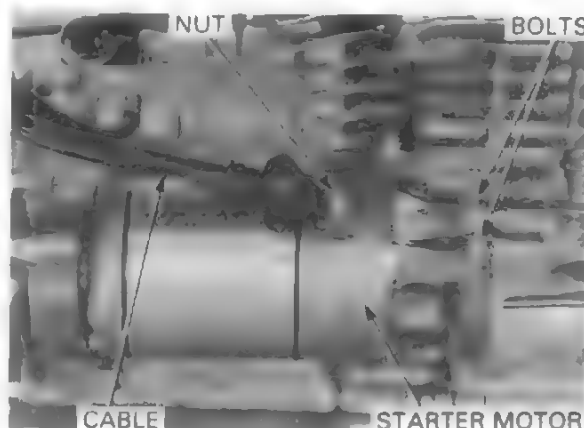
### REMOVAL

#### **⚠ WARNING**

*When the ignition switch OFF, remove the negative cable at the battery before servicing the starter motor.*

Remove the right engine side cover (page 6-2).

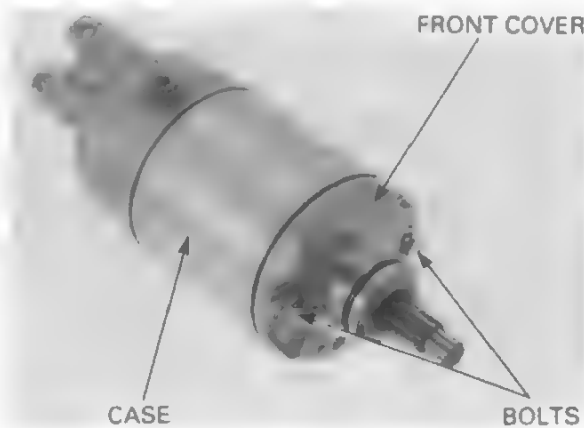
Disconnect the starter cable from the starter motor. Remove the two mounting bolts and the starter motor.



### DISASSEMBLY

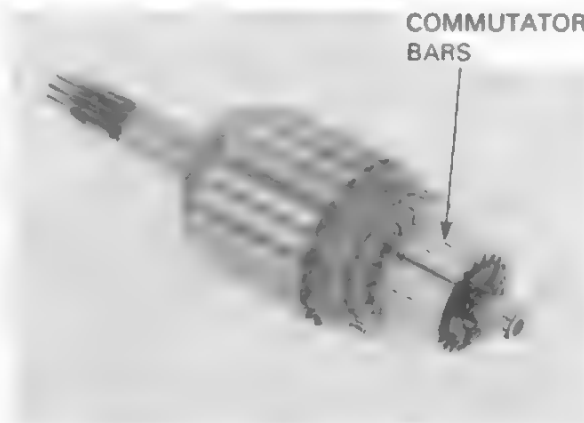
Remove the two starter motor case bolts and remove the front cover, motor case and armature coil.

Record the number and location of shims for correct assembly.



### INSPECTION

Inspect the commutator bars for discoloration. Bars discolored in pairs indicate grounded armature coils, in which case the starter motor must be replaced.

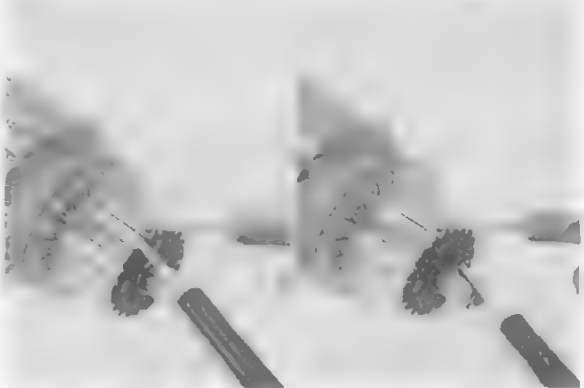


Check for continuity between individual commutator bars; there should be continuity.

Also, check for continuity between individual commutator bars and the armature shaft; there should be no continuity.

CONTINUITY

NO CONTINUITY



## ELECTRIC STARTER

Check for continuity between the cable terminal and the brush wire (the light blue colored wire or the insulated brush holder).

There should be continuity.

Check for continuity between the rear cover and the brush wire (the light blue cover wire or the insulated brush holder).

There should be no continuity.

CONTINUITY

NO CONTINUITY

BRUSH HOLDER

Disassemble the rear cover.

Inspect the brushes for damage and measure the brush length.

**SERVICE LIMIT: 9.0 mm (0.35 in)**

Check the bushing of the rear cover for wear or damage.

BUSHING

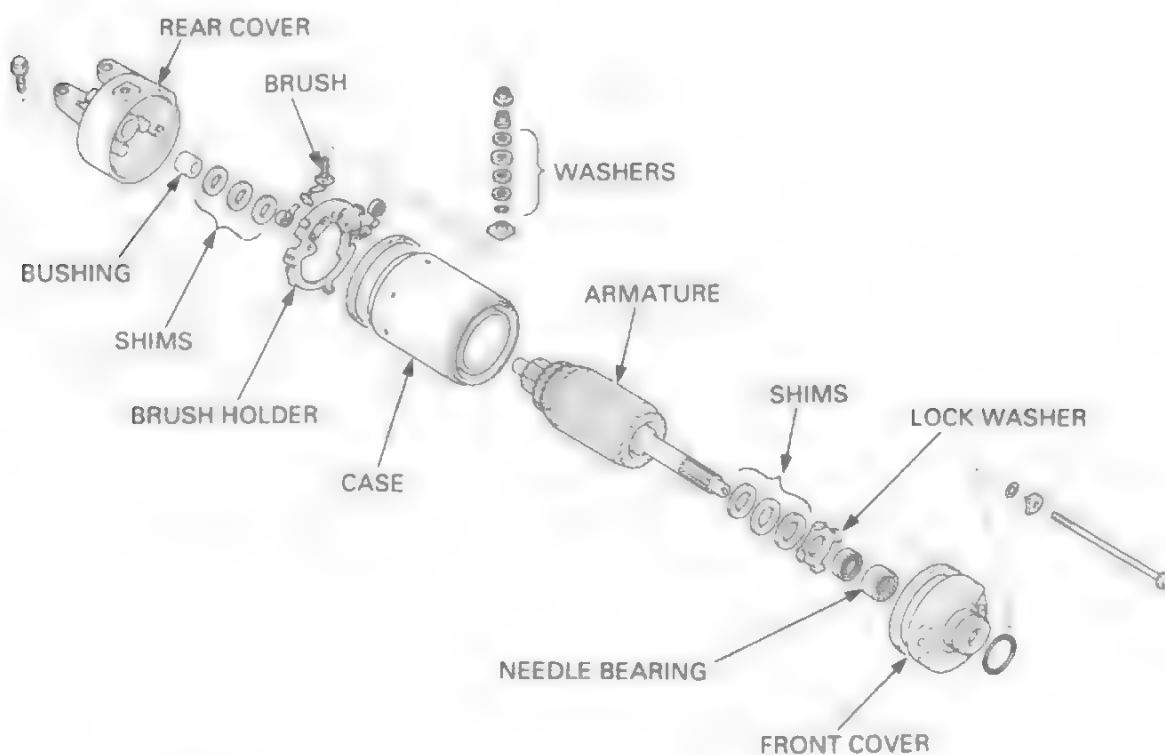
Check the needle bearing of the front cover for smooth rotation.

Check the dust seal for wear or damage.

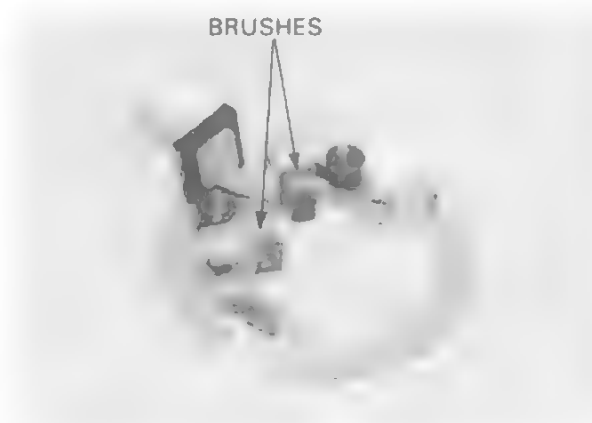
DUST SEAL

NEEDLE BEARING

## ASSEMBLY

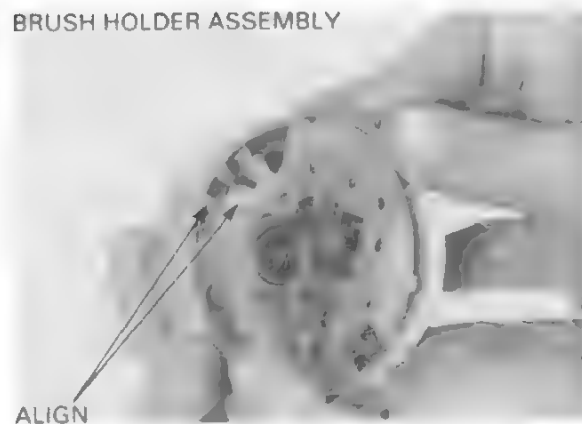


Install the brushes in the brush holders as shown.



Install the brush holder assembly to the rear cover, aligning the tab of the holder with the groove of the rear cover.

BRUSH HOLDER ASSEMBLY

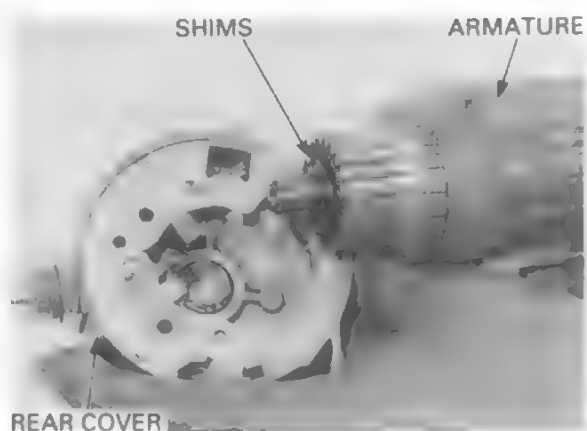




## ELECTRIC STARTER

Install the shims to the terminal and armature coil in the correct positions as recorded.

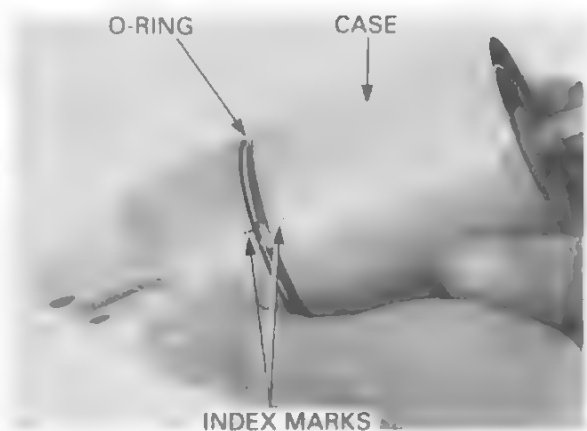
Install the armature in the rear cover.



Install the O-ring on the motor case.  
Assemble the motor case and rear cover, aligning the index marks.

**NOTE:**

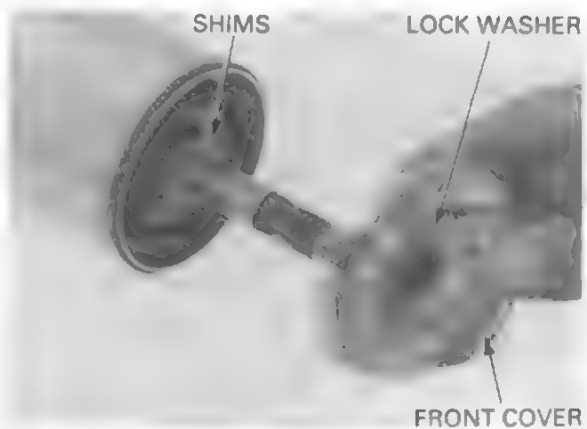
Hold the armature coil shaft, or armature might be drawn out by the magnetic field.



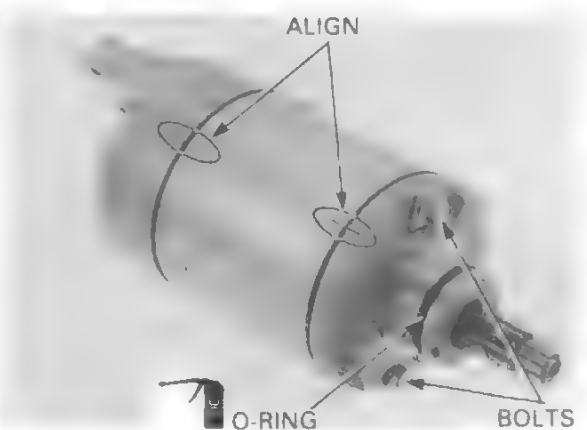
Apply grease to the dust seal of the front cover.  
Install the shims to the shaft in the correct positions as recorded, and O-ring to the case.

**CAUTION:**

*Do not damage the front cover dust seal.*



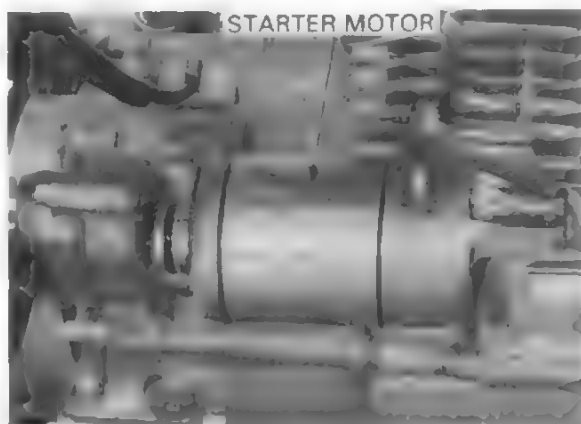
Align the index marks of the front cover, motor case and rear cover.  
Tighten the bolts securely.  
Apply oil to the O-ring and install it on the front cover.



## INSTALLATION

Install the starter motor with the two mounting bolts.  
Connect the starter cable to the motor.

Install the right engine side cover (page 6-10).



## STARTER RELAY SWITCH

### OPERATION INSPECTION

Remove the seat and battery holder bracket.

Depress the starter switch button with the ignition switch ON.

The coil is normal if the starter relay switch clicks.

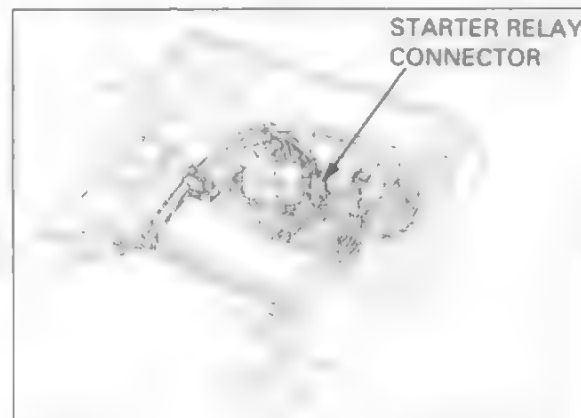


### VOLTAGE INSPECTION

If the switch "CLICK" is not heard, disconnect the relay connector.

Measure the voltage between the Yellow/Red (+) and Light green (-) wire terminals of the wire harness side.

The battery voltage should be indicated when the starter switch button is depressed with the ignition switch ON and the transmission in neutral.



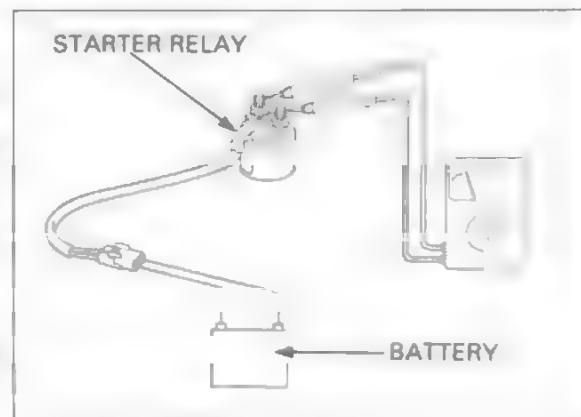
### CONTINUITY INSPECTION

Connect an ohmmeter to the starter relay switch large terminals.

Connect a fully charged 12V battery to the starter relay switch connector terminals (Yellow/Red and Light green).

Check for continuity between the starter relay switch terminals.

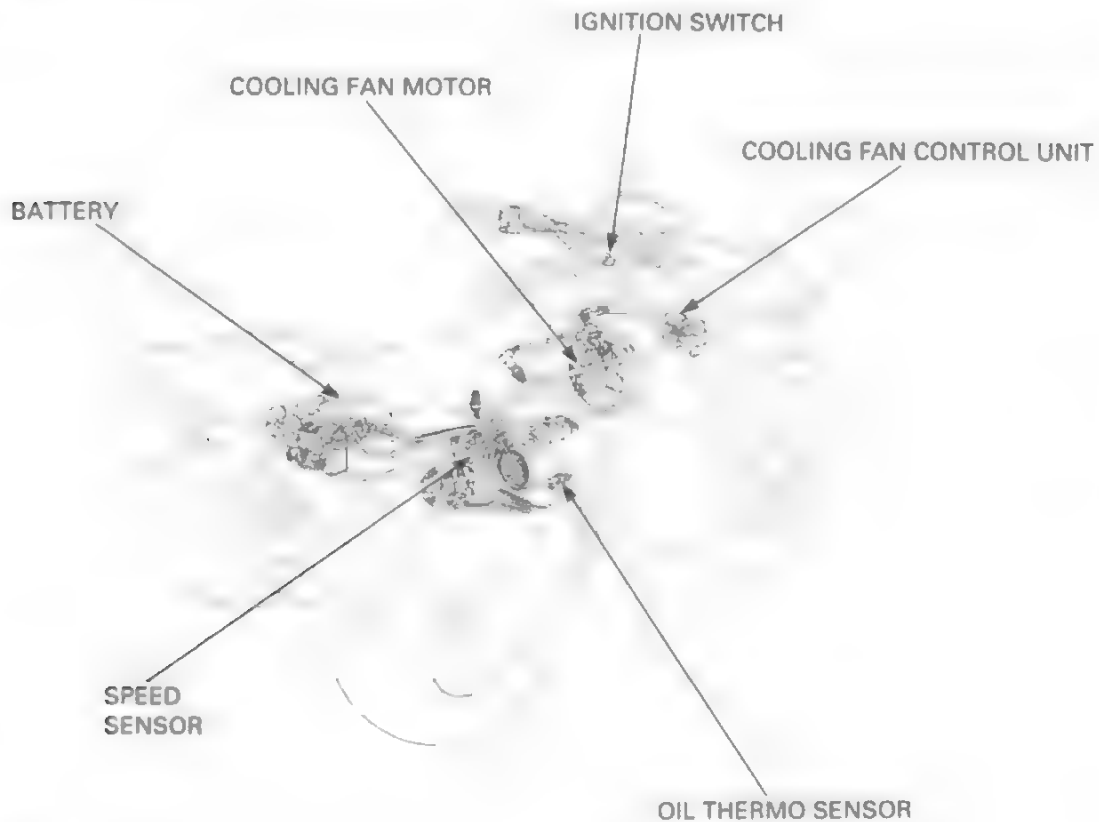
There should be continuity while 12V battery is connected to the starter relay switch connector terminals and there should be no continuity when the battery is disconnected.



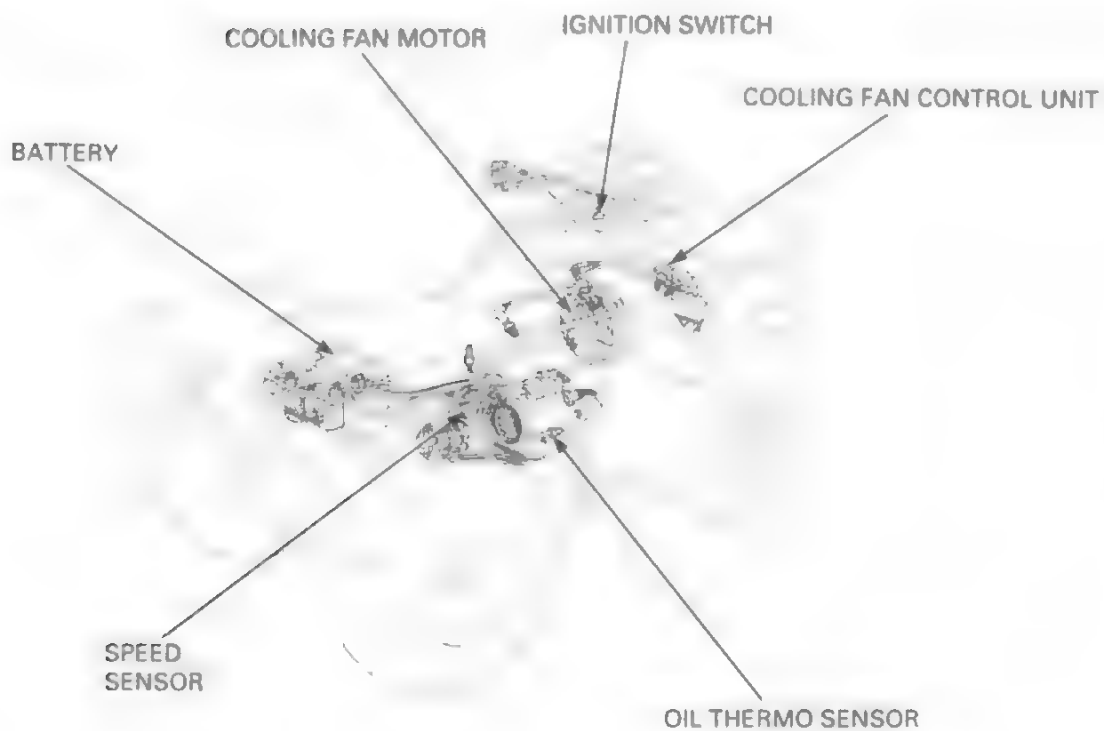
## LIGHTS/METERS/SWITCHES

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TRX450S ('98-'01):



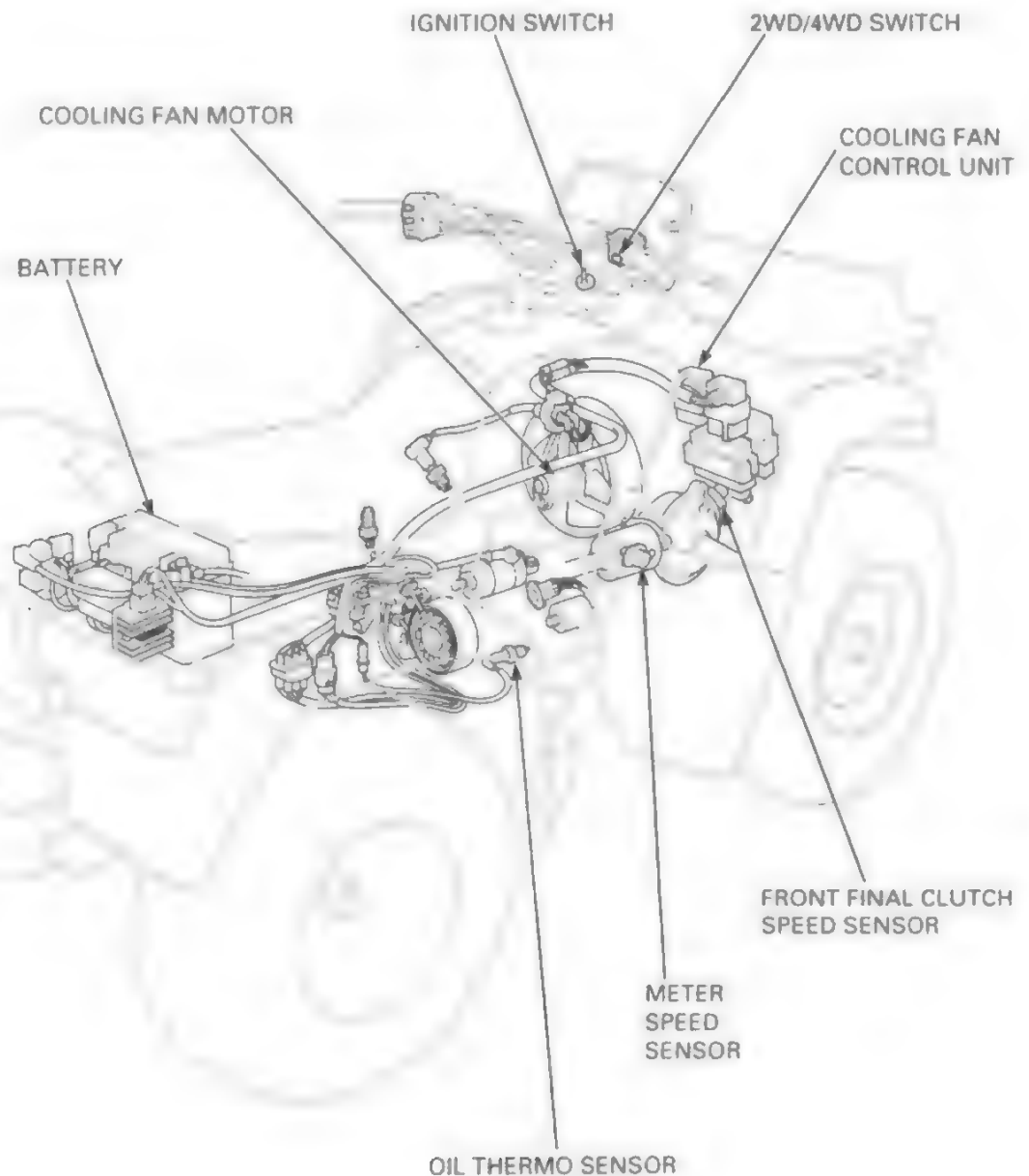
TRX450ES ('98-'01):



# 20. LIGHTS/METERS/SWITCHES

SERVICE INFORMATION	20-2	ACCESSORY SOCKET	20-15
TROUBLESHOOTING	20-2	IGNITION SWITCH	20-17
HEADLIGHT	20-8	HANDLEBAR SWITCHES	20-17
ASSIT HEADLIGHT	20-9	NEUTRAL/REVERSE SWITCH	20-18
TAILLIGHT	20-11	COOLING FAN CONTROL UNIT	20-19
COMBINATION METER	20-12	OIL THERMOSENSOR	<u>20-19</u>
SPEED SENSOR	20-13	CARBURETOR HEATER	20-20

After '01:



## SERVICE INFORMATION

### GENERAL

- A continuity check can usually be made without removing the part from the vehicle by simply disconnecting the wires and connecting a continuity tester or voltmeter to the terminals.

### SPECIFICATIONS

ITEM			SPECIFICATIONS
Bulbs	Headlight	'98 - '01	12 V - 25/25 W X 2
		After '01	12 V - 30/30 W X 2
	Assist headlight		12 V - 45W
	Taillight		12 V - 5 W X 2
Fuse	Brake light (After '01: Quebec province only)		12 V - 21 CP
	Indicator (Oil/Reverse/Neutral)		LED
	Main fuse		30 A
	Sub fuse	'98 - '01	15 A X 2, 10 A X 2
		After '01	15 A X 2, 10 A X 3
	MOTOR FUSE (TRX450ES only)		30 A

### TORQUE VALUES

Neutral and reverse switch mounting bolt	12 N•m (1.2 kgf•m, 9 lbf•ft)	Apply a locking agent to the threads.
Oil thermo sensor	18 N•m (1.8 kgf•m, 13 lbf•ft)	
Speed sensor mounting bolt (After '01)	10 N•m (1.0 kgf•m, 7 lbf•ft)	
Final clutch speed sensor mounting bolt (After '01)	10 N•m (1.0 kgf•m, 7 lbf•ft)	
Final clutch cover bolt (After '01)	7 N•m (0.7 kgf•m, 5 lbf•ft)	

### TOOLS

Inspection adapter	07GMJ-ML80100
--------------------	---------------

## TROUBLESHOOTING

#### Light does not come on when light switch is turned on

- Bulb burned out
- Faulty switch
- Wiring to that component has open circuit

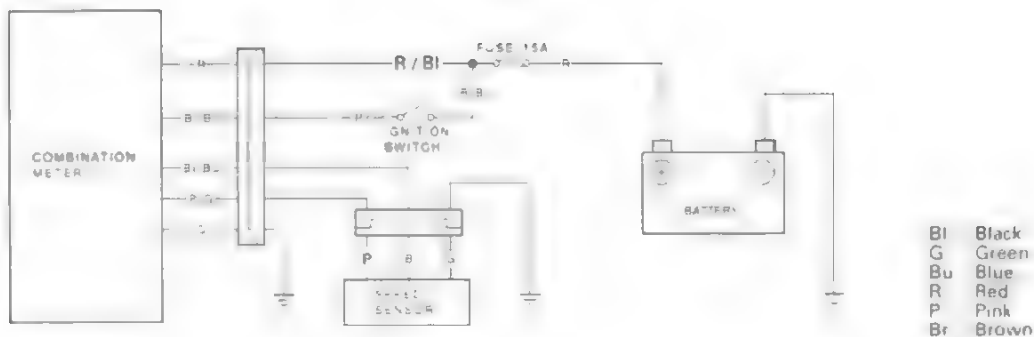
#### Headlight beams do not shift when dimmer switch is operated

- Faulty dimmer switch
- Bulb burned out
- Wiring to that component has open circuit

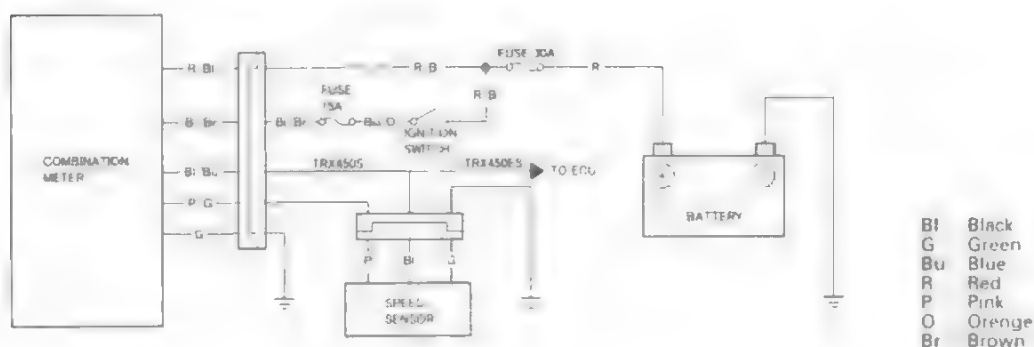
## TROUBLESHOOTING

## COMBINATION METER

'98 - '01:



After '01:



The speedometer operates normally, but the hour meter or odometer/tripmeter does not operate.

- Faulty combination meter

The hour meter or odometer/tripmeter operates normally, but the speedometer does not operate.

- blown main or sub fuse
- loose or corroded terminal of the connectors
- discharged battery

Check for loose or poor contact of the speed sensor 3P connector.

With the ignition switch on, measure the voltage at the (After '01: meter) speed sensor connector.

Connection: Black/blue (+) and body ground (-)

Standard: Battery voltage

Abnormal

- Loose or poor contact of related terminal.
- Open circuit in black/blue wires.

Normal

Remove the (After '01: meter) speed sensor and check for damage of the (After '01: meter) speed sensor (page 20-13).

Abnormal

- Faulty (After '01: meter) speed sensor.

Normal

## LIGHTS/METERS/SWITCHES

Connect the inspection adapter.

'98 - '01:

Measure the output voltage (sensor signal) at inspection terminal with the ignition switch on while turning the speed sensor shaft by your finger.

**Connection: Green (+) and White (-)**

**Standard: Repeat 0 to above 5 V**

**After '01:**

Place a support block under the engine to raise all of the wheels off the ground. Place the vehicle in four-wheel drive.

Turn the ignition switch on. Rotate the front wheel by hand and measure the output voltage (sensor signal) at the inspection terminal.

**Connection: Green (+) and White (-)**

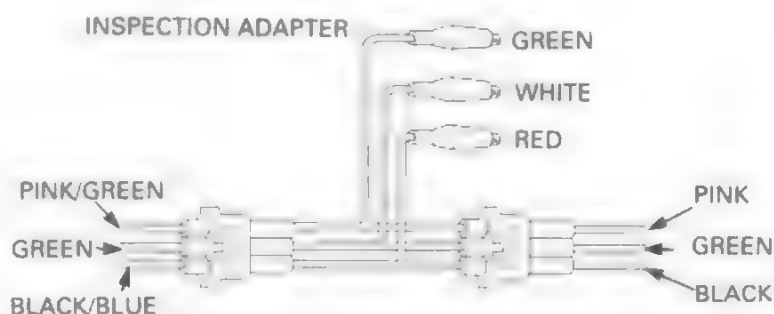
**Standard: Repeat 0 to above 5V**

**Special tool:**

**Inspection adapter 07GMJ-ML80100**

Abnormal  
(No input voltage)

• Faulty (After '01: meter) speed sensor.



Remove the speedometer, but do not disconnect the speedometer connector (page 20-12).

With the ignition switch off, measure the voltage at the bottom of the speedometer terminal.

**Connection: Red (+) (After '01: Red/Black (+)) and body ground (-)**

**Standard: Battery voltage**

Abnormal

• Loose or poor contact of related terminal.  
• Open circuit in red/black wires between the combination meter and battery.

Normal

With the ignition switch on, measure the voltage at the bottom of the speedometer terminal.

**Connection: Black/brown (+) and body ground (+)**

**Standard: Battery voltage**

Abnormal

• Loose or poor contact of related terminal.  
• Open circuit in Black/brown wires between the combination meter and battery.

Normal

With the ignition switch on, check for the continuity between the Pink/green wire of the speedometer.

**Connection: Pink/green**

**Standard: Continuity**

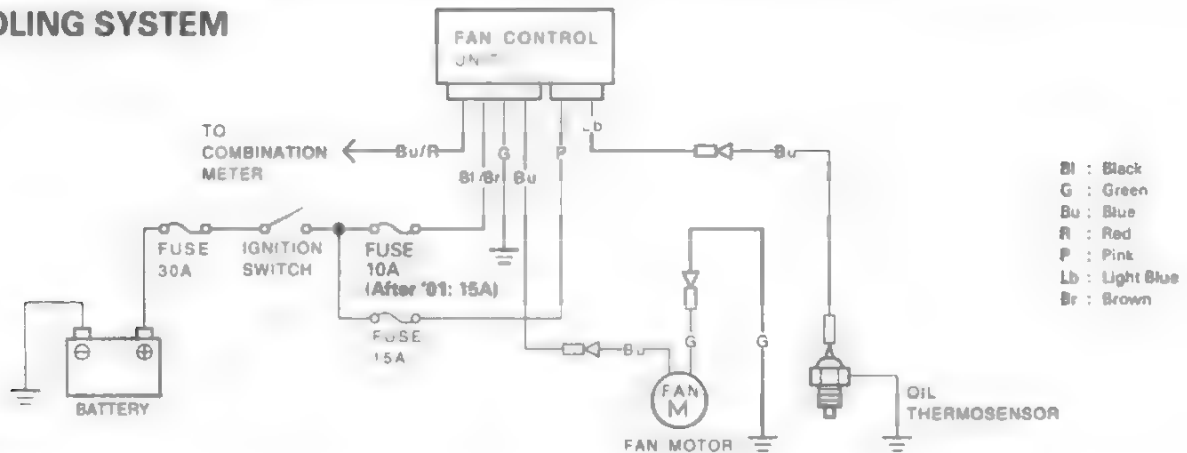
Abnormal

• Loose or poor contact of related terminal.  
• Open circuit in Pink/green wires between the combination meter and (After '01: meter) speed sensor.

Normal

• Faulty speedometer

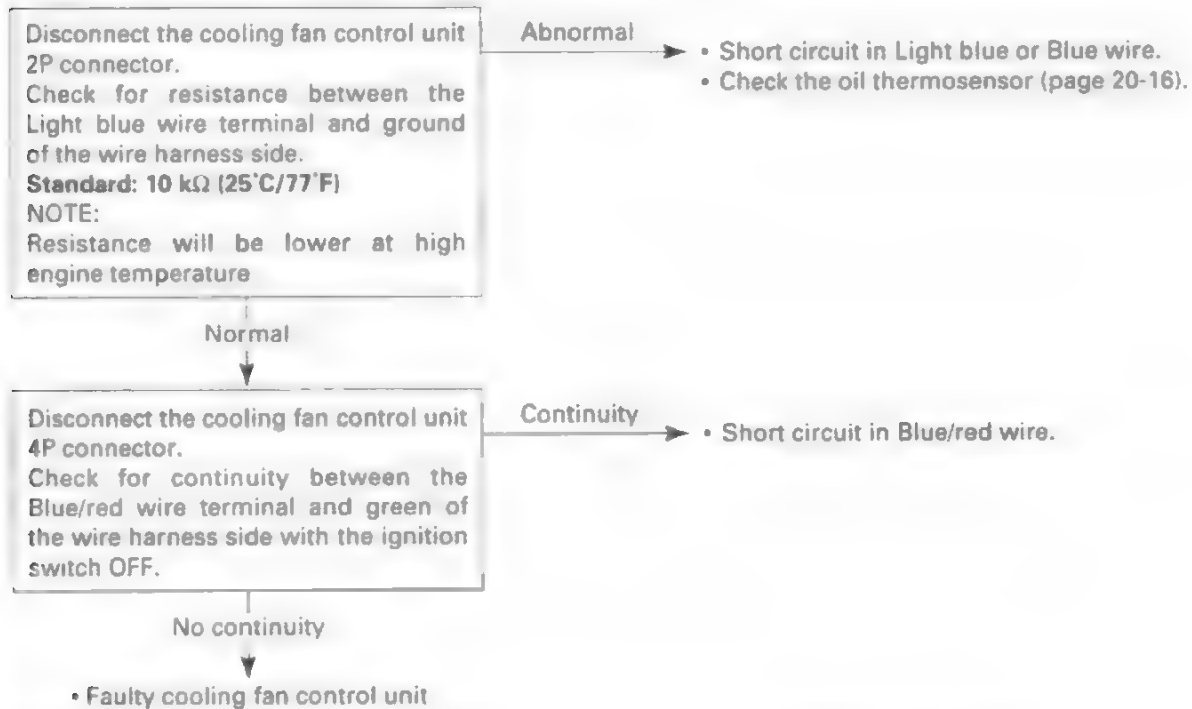
# OIL COOLING SYSTEM



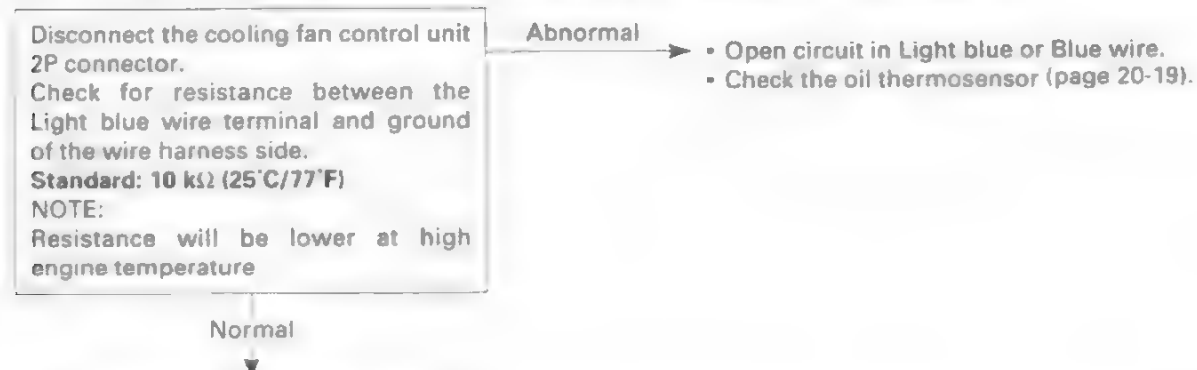
## NOTE:

- To check the cooling fan motor function, disconnect the cooling fan control unit 4P connector.
- The cooling fan should turn when directly connected a battery.

## Oil warning indicator does not go off.



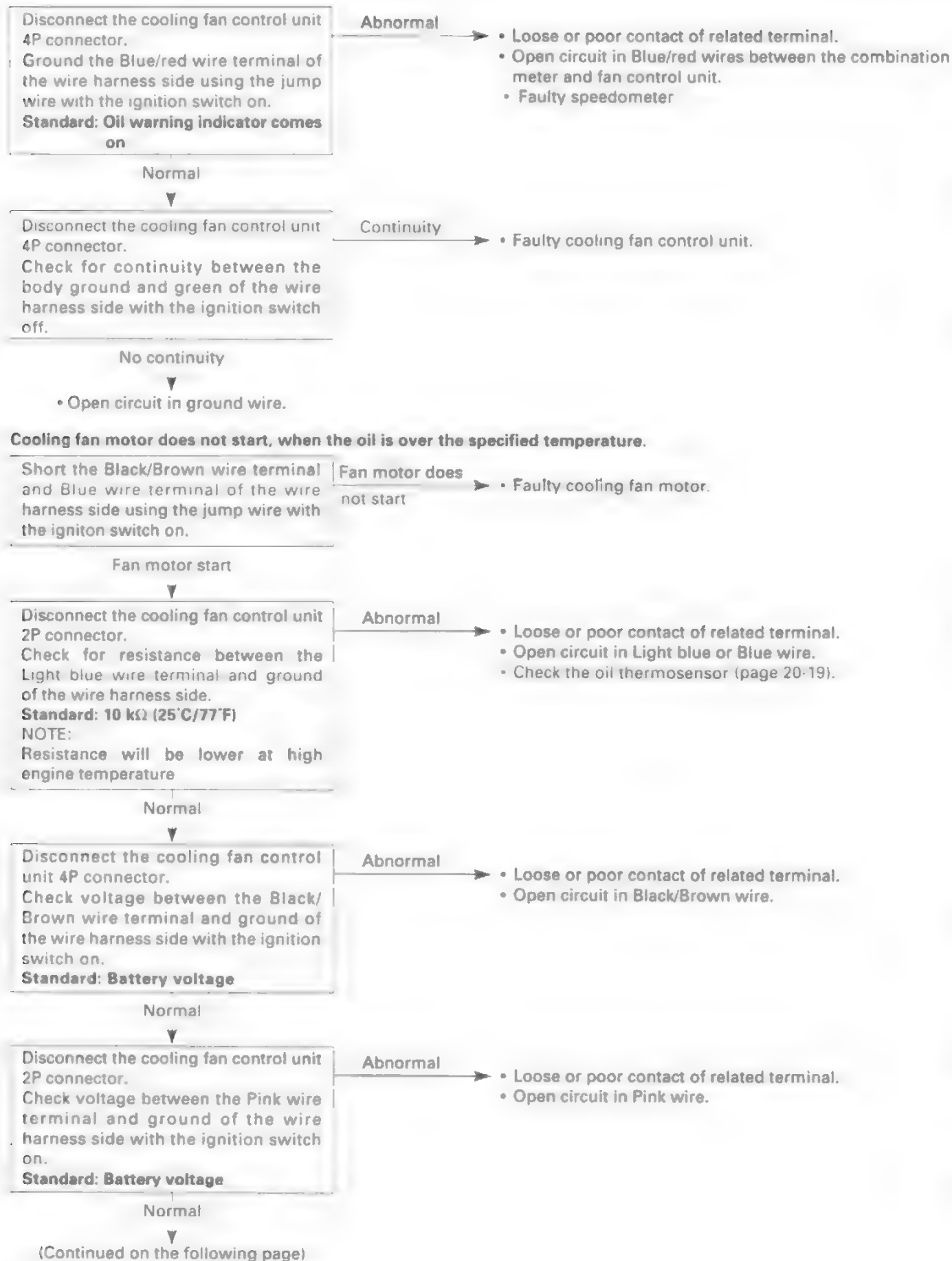
## Oil warning indicator does not come on, when the oil is over the specified temperature.



(Continued on the following page)



## LIGHTS/METERS/SWITCHES



Disconnect the cooling fan control unit 4P connector.  
Check for continuity between the body ground and green of the wire harness side with the ignition switch off.

Continuity

→ • Faulty cooling fan control unit.

No continuity

• Open circuit in ground wire.

**Cooling fan motor does not stop.**

Disconnect the oil thermosensor connector.

Motor stop

→ • Faulty oil thermosensor.

Motor does not stop

Connect the oil thermosensor connector.  
Disconnect the cooling fan control unit 2P connector.  
Check for resistance between the Light blue wire terminal and ground of the wire harness side.  
**Standard: 10 k $\Omega$  (25°C/77°F)**  
**NOTE:**  
Resistance will be lower at high engine temperature

Abnormal

- Short circuit of related terminal.
- Short circuit in Light blue or Blue wire.
- Check the oil thermosensor (page 20-19.)

Normal

Disconnect the cooling fan control unit 4P connector.  
Check voltage between the Black/brown wire terminal and ground of the wire harness side with the ignition switch on.  
**Standard: Battery voltage**

Abnormal

- Loose or poor contact of related terminal.
- Open or short circuit in Black/Brown wire.

Normal

Disconnect the cooling fan control unit 2P connector.  
Check voltage between the Pink wire terminal and ground of the wire harness side with the ignition switch on.  
**Standard: Battery voltage**

Abnormal

- Loose or poor contact of related terminal.
- Open or short circuit in Pink wire.

Normal

Disconnect the cooling fan control unit 4P connector.  
Check for continuity between the body ground and green of the wire harness. Side with the ignition switch off.

Continuity

→ • Faulty cooling fan control unit.

No continuity

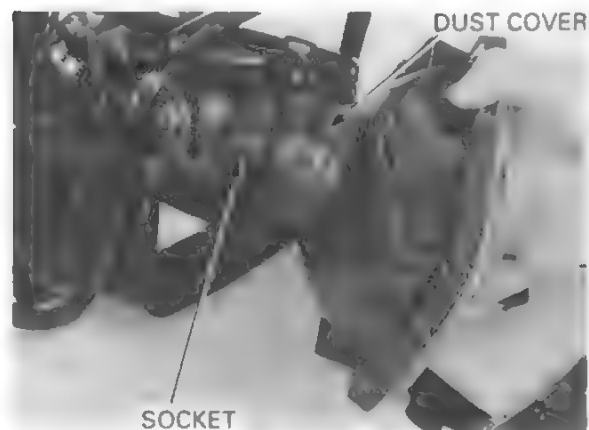
• Open circuit in ground wire.

## LIGHTS/METERS/SWITCHES

Remove the two bolts and assist headlight.



Disconnect the headlight socket.  
Remove the dust cover.

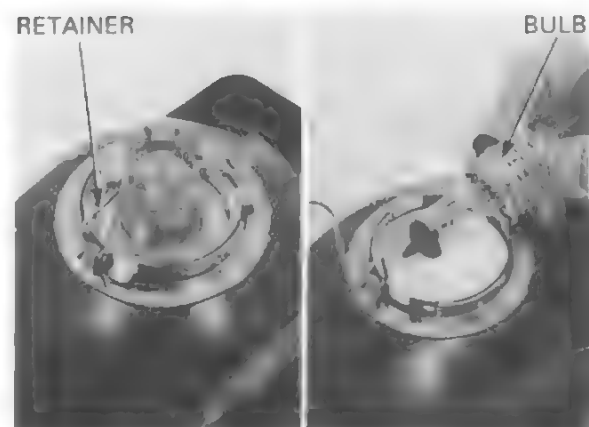


Release the bulb retainer and replace the bulb.

### CAUTION:

*Avoid touching halogen headlight bulbs. Fingerprints can create hot spots that cause a bulb to break.*

If you touch the bulb with your bare hands, clean it with cloth moistened with denatured alcohol to prevent early bulb failure.



Install the dust cover tightly against headlight unit.

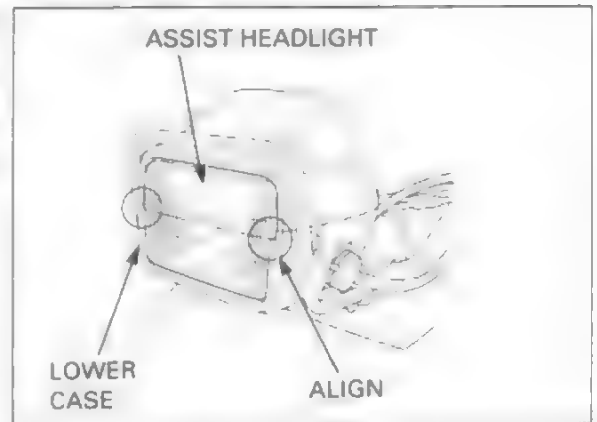
Connect the assist headlight socket.



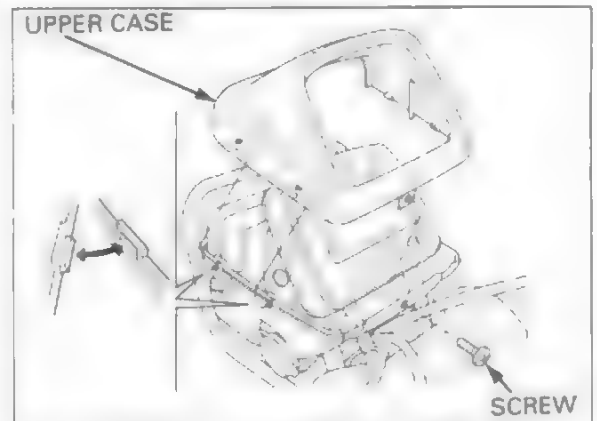
Install the assist headlight and tighten the two bolts loosely.

Align the slit on the lower assist headlight case and line on the lense.

Hold the assist headlight and tighten the bolts securely.



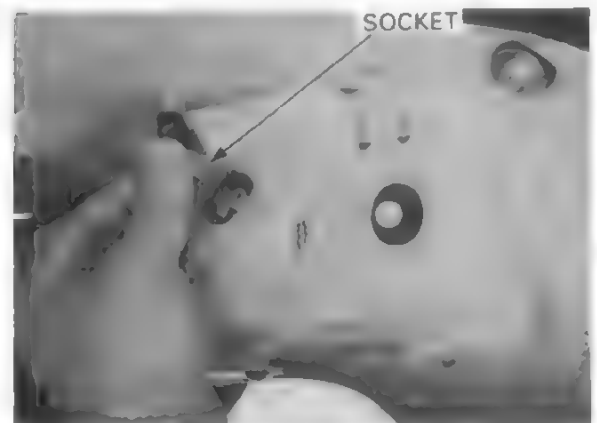
Install assist headlight upper case and tighten the screw.



## TAILLIGHT

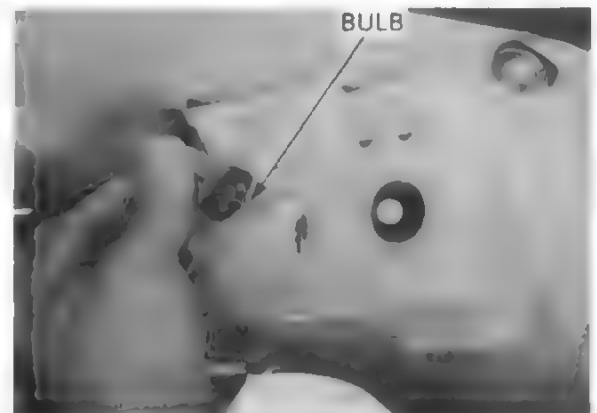
### BULB REPLACEMENT

Turn the bulb socket counterclockwise and remove the bulb socket from the taillight case.



Remove the bulb from the socket and replace it with a new one.

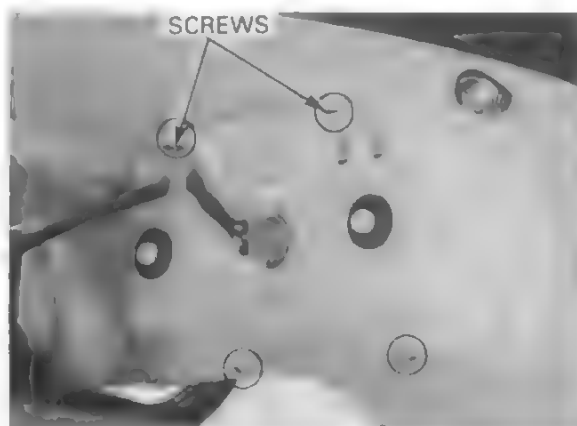
Install the bulb in the reverse order of removal.



### REMOVAL/INSTALLATION

Disconnect the taillight connector.  
Remove the screws and taillight unit.

Installation is in the reverse order of removal.

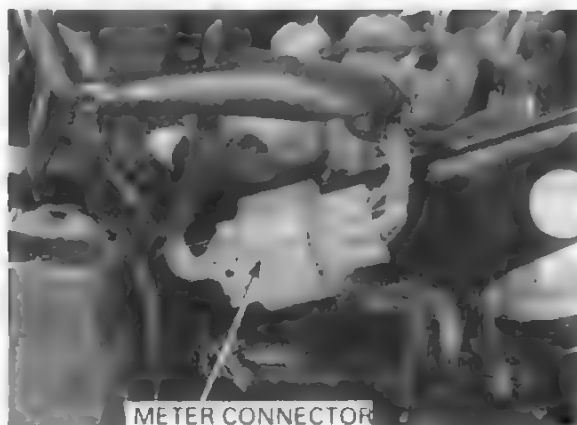


## COMBINATION METER

### REMOVAL

Remove the front fender (page 2-6).  
Remove the assist headlight (page 20-8).

Disconnect the combination meter connector.



Remove the four nuts and combination meter.

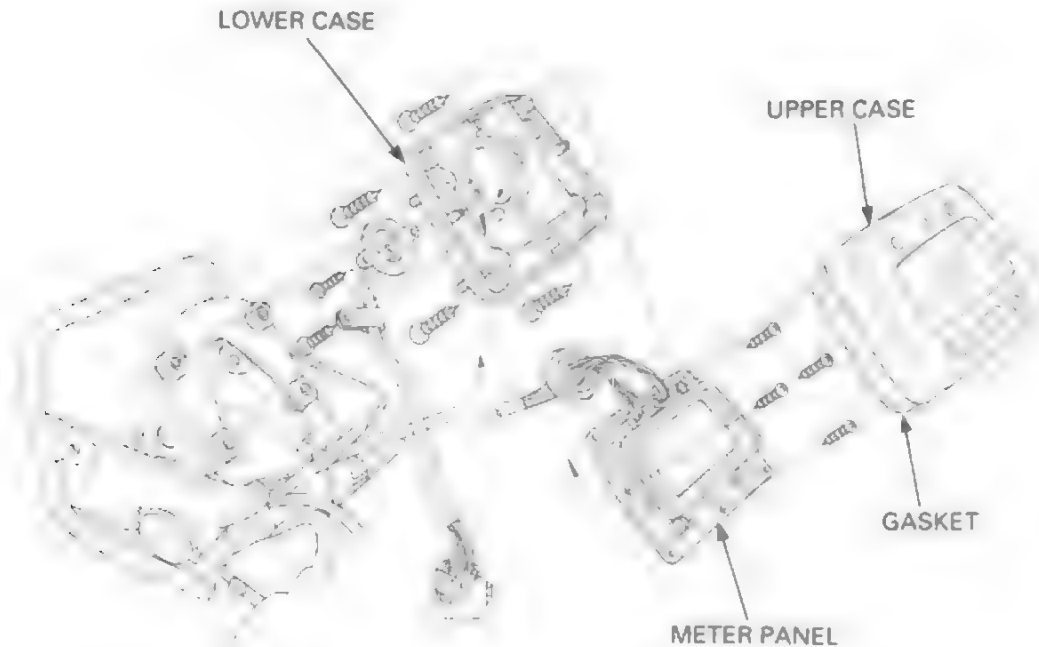
### INSTALLATION

Installation is in the reverse order of removal.

#### NOTE:

Route the wire harnesses properly (page 1-21).





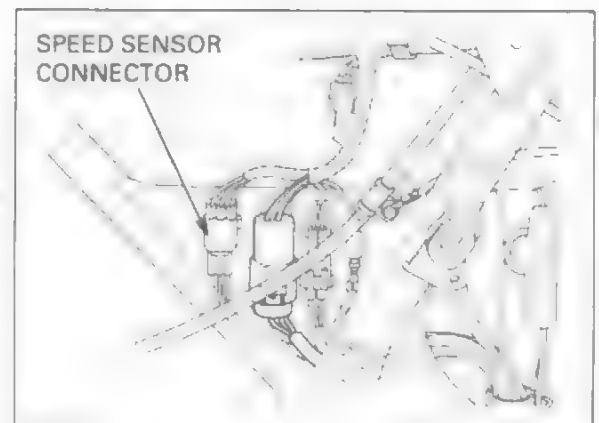
## SPEED SENSOR

### REMOVAL ('98 - '01)

#### NOTE:

For speed sensor inspection see page 20-3.

Disconnect the speed sensor connector.

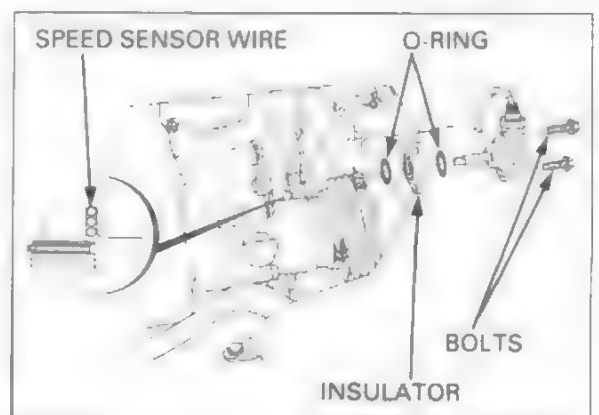


Remove the two bolts and speed sensor.  
Remove the speed sensor insulator and O-rings.

Installation is in the reverse order of removal.

#### NOTE:

Route the wire harnesses properly (page 1-21).

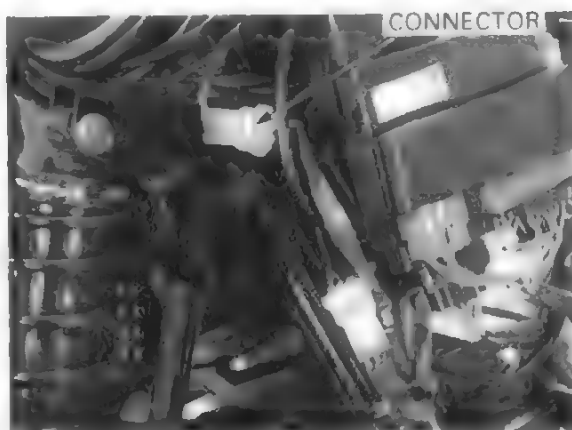


### SPEED SENSOR REMOVAL (After '01)

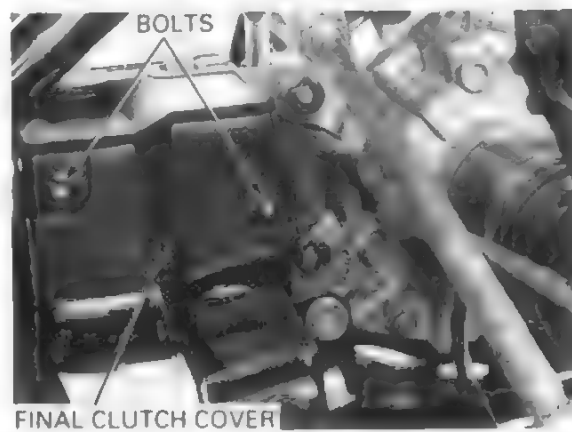
#### NOTE:

For speed sensor inspection see page 20-3.

Disconnect the speed sensor connector.



Remove the final clutch cover bolts and cover.



Remove the speed sensor mounting bolts and the speed sensor.

Remove the O-ring from the speed sensor.

Installation is in the reverse order of removal.

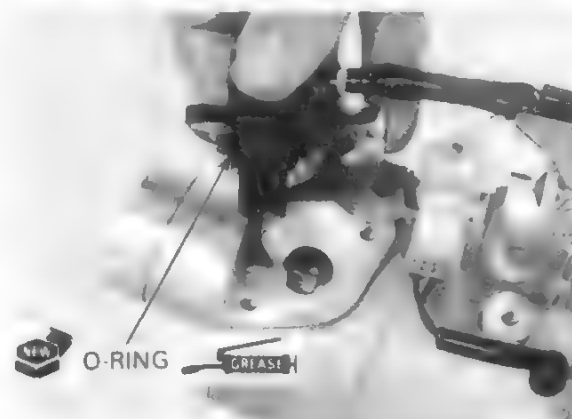
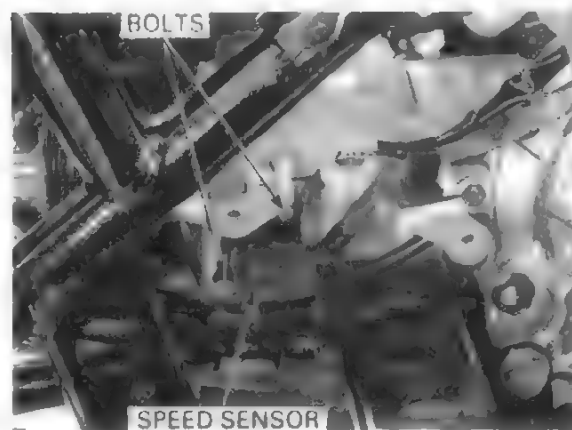
#### NOTE:

- Apply grease to a new speed sensor O-ring.
- Route the wire harness properly (page 1-21).

#### TORQUE:

Speed sensor mounting bolt:  
10 N·m (1.0 kgf·m, 7 lbf·ft)

Final clutch cover bolt:  
7 N·m (0.7 kgf·m, 5 lbf·ft)



## FRONT FINAL CLUTCH SPEED SENSOR REMOVAL (After '01)

Disconnect the final clutch speed sensor connector.



Remove the final clutch speed sensor mounting bolts and the final clutch speed sensor and cover.

Remove the O-ring from the final clutch speed sensor.



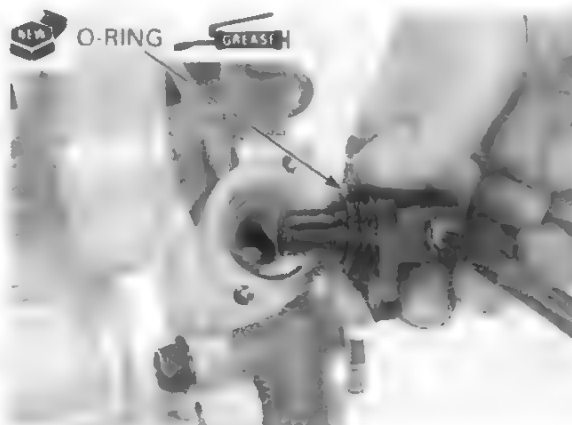
Installation is in the reverse order of removal.

### NOTE:

- Apply grease to a new final clutch speed sensor O-ring.
- Route the wire harness properly (page 1-21).

### TORQUE:

Final clutch speed sensor mounting bolt:  
10 N·m (1.0 kgf·m 7 lbf·ft)

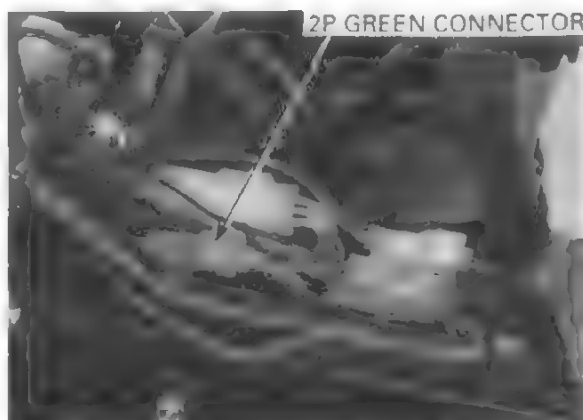


## ACCESSORY SOCKET

### REMOVAL

Remove the front fender (page 2-6).  
Remove the assistant headlight (page 20-8).

Disconnect the accessory socket (2P GREEN) connector.





Loosen the lock nut and remove the accessory socket.

ACCESSORY SOCKET



LOCK NUT

### INSPECTION

Check for voltage between the White/black and green wire terminal there should be battery voltage with the ignition switch on.

If there is no voltage, check for an open circuit or loose connection in the White/black wire.

If there is battery voltage the accessory socket internal fuse is blown. Replace the accessory socket. (page 20-15).

#### NOTE:

The accessory socket has an internal fuse. If the internal fuse is blown, replace the accessory socket assembly.

ACCESSORY SOCKET CONNECTOR



### INSTALLATION

Install the accessory socket by aligning the tab with the cut-out on the assist headlight lower case.

ALIGN



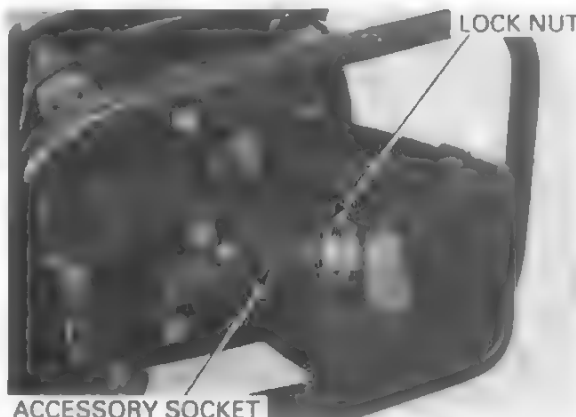
ACCESSORY SOCKET

Tighten the lock nut securely by hand.

Connect the accessory socket connector.

Install the assist headlight (page 20-9).  
Install the front fender (page 2-9).

LOCK NUT



ACCESSORY SOCKET

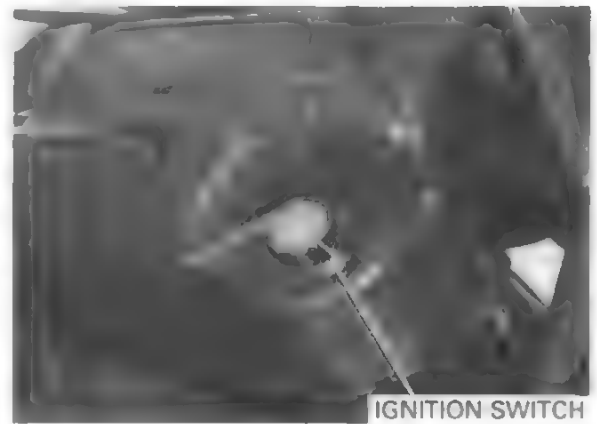
## IGNITION SWITCH

### INSPECTION

Remove the front fender (page 2-6).  
Disconnect the ignition switch wire connector.  
Check for continuity between the wire terminals of the ignition switch connector in each switch position. Continuity should exist between the color coded wires as follows:

#### IGNITION SWITCH

	BAT2	DC	BAT1	BAT
ON	○	○	○	○
OFF				
WIRE COLOR	R/B	P	R	BI



IGNITION SWITCH

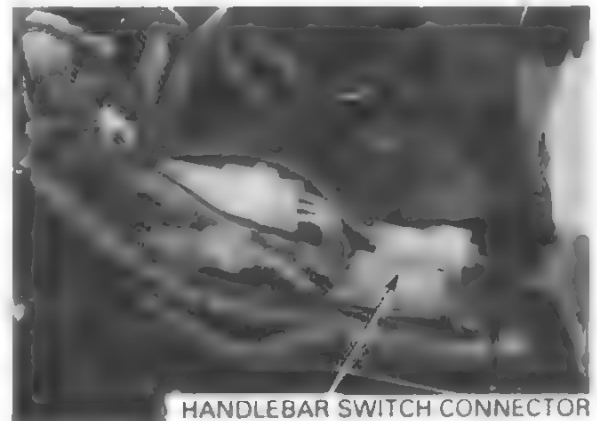
## HANDLEBAR SWITCHES

### NOTE:

- The handlebar switches (lighting, dimmer, engine stop, starter shift (TRX450ES only-switches) must be replaced as an assembly.
- For TRX450ES shift switch inspection see page 21-30.

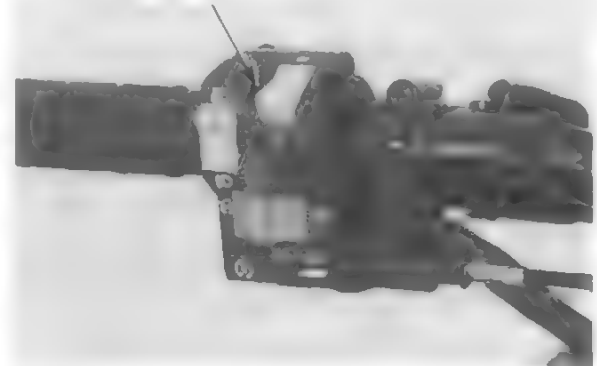
Remove the front fender (page 2-6).  
Disconnect the handlebar switch connector.

Check for continuity between the wire terminals of the handlebar switch connector.  
Continuity should exist between the color coded wire terminals as follows:



HANDLEBAR SWITCH CONNECTOR

TRX450S/FM shown:  
HANDLEBAR SWITCH

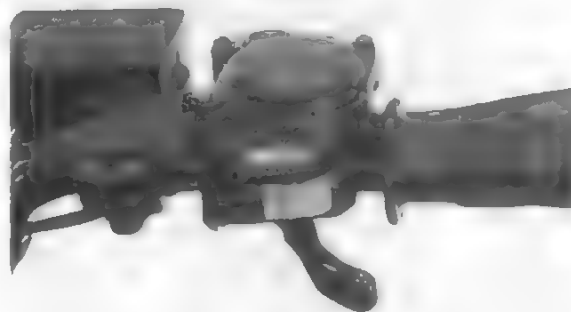


IGNITION SWITCH				DIMMER SWITCH				ENGINE STOP SWITCH			STARTER SWITCH		
BAT 3		TL	(HL)	(HL)		LO	HI	BAT4		IG	BAT3		ST
ON	○	○	○	LO	○	○		OFF			FREE		
OFF				(N)	○	○	○	RUN	○	○	PUSH	○	○
WIRE COLOR	BI/BR	BR	●	HI	○		○	OFF			WIRE COLOR	BI/BR	Y/R
				WIRE COLOR	●	W	Bu, BI	WIRE COLOR	BI/G	BI/W			

## 2WD/4WD SWITCH (After '01)

Check for continuity between the Brown/Red and Brown/Black terminals.

**STANDARD:** Continuity when switched to "4WD"

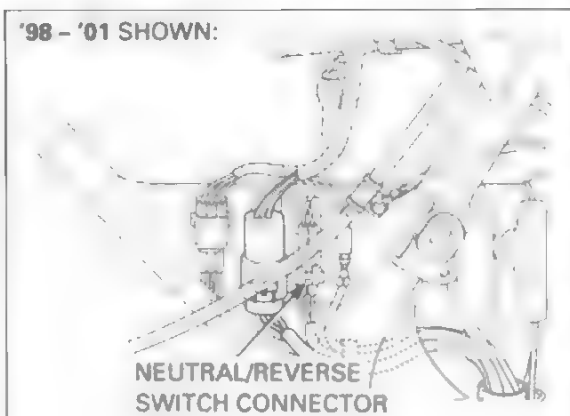


## NEUTRAL/REVERSE SWITCH

### INSPECTION

**TRX450S/FM:** Disconnect the neutral/reverse switch 2P connector.

'98 - '01 SHOWN:



The neutral/reverse switch is functional if continuity exists between the Light green/red wire terminal of the switch side and body ground only when the transmission is in neutral.

Also continuity exists between the Gray wire terminal of the switch side and body ground only when the transmission is in reverse.

For TRX450ES/FE gear position switch inspection see page 21-29.

### REMOVAL/INSTALLATION

Remove the alternator cover (page 10-6).

Remove the bolt and neutral/reverse (or gear position) switch.

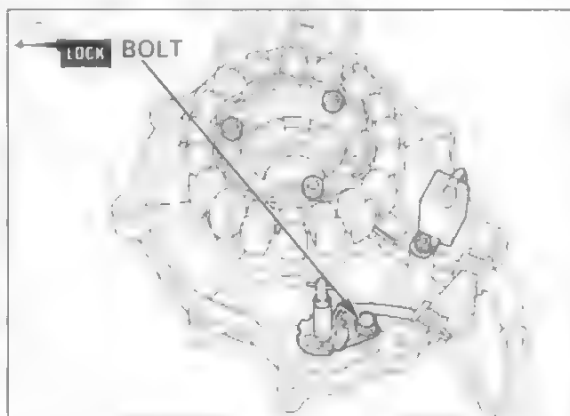
Installation is in the reverse order of removal.

#### TORQUE:

**NEUTRAL/REVERSE SWITCH MOUNTING BOLT**  
12 N·m (1.2 kgf·m, 9 lbf·ft)

#### NOTE:

- Apply a locking agent to the neutral/reverse switch mounting bolt threads.
- At alternator cover installation, note the direction of the neutral/reverse switch pin.



## COOLING FAN CONTROL UNIT

### SYSTEM INSPECTION

#### NOTE:

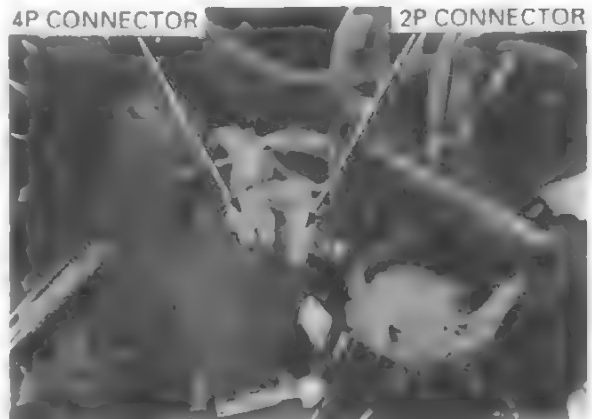
Check the system components and lines step-by-step according to the troubleshooting on page 20-4.

Remove the front fender (page 2-5).

Disconnect the cooling fan control unit connectors and check them for loose contact or corroded terminals.

Check for voltage and continuity between the connector terminals of the wire harness side as follows:

TERMINAL	SPECIFICATION
Light blue – Body ground	9.5 – 10.5 k $\Omega$ (25°C/77°F)
Blue – Body ground	Continuity
Green – Body ground	Continuity
Black/Brown – Body ground	Battery voltage should resister with the ignition switch ON
Pink – Body ground	



## OIL THERMOSENSOR

### INSPECTION/REMOVAL

Disconnect the cooling fan control unit 2P (Green) connector.

Check for resistance between Light blue wire terminal of the switch side and body ground.

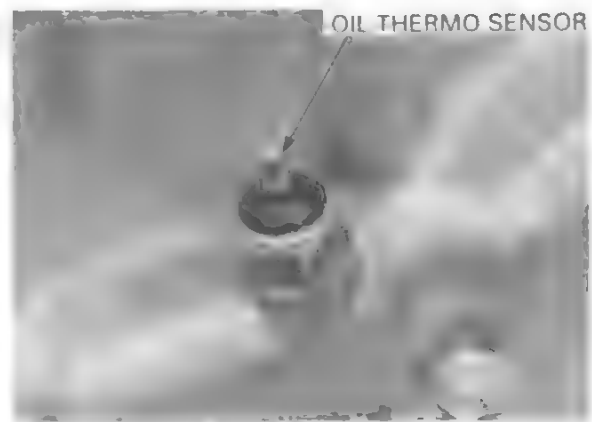
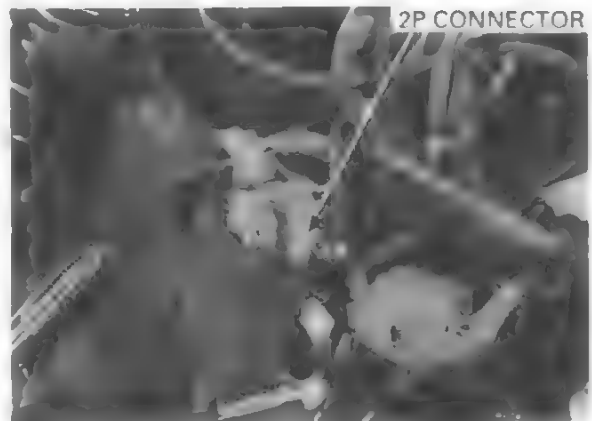
**STANDARD: 9.5 – 10.5 k $\Omega$  (25°C/77 F)**

If not, disconnect the wire from the oil thermo switch.

Remove the engine guard.

Drain the engine oil (page 3-11).

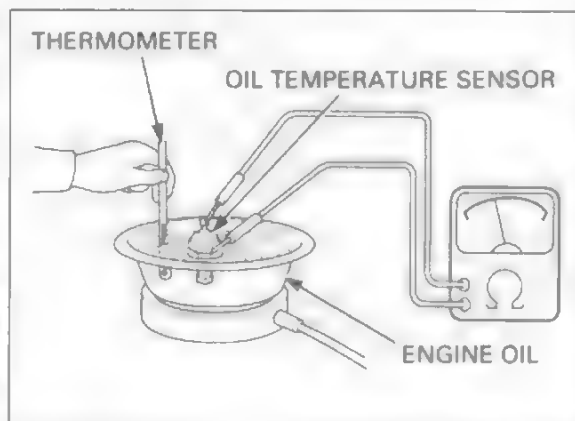
Remove the sensor from the rear crankcase.



Suspend the oil temperature sensor in heated engine oil to check its operation.  
Do not let the thermometer or sensor touch the pan, or false readings will result.  
Connect ohmmeter probes across the terminals of the sensor and measure the resistance.

Replace the sensor if the readings are out of the ranges as shown.

Temperature	150°C (302°F)	170°C (338°F)
Resistance	306 – 340 $\Omega$	209 – 231 $\Omega$



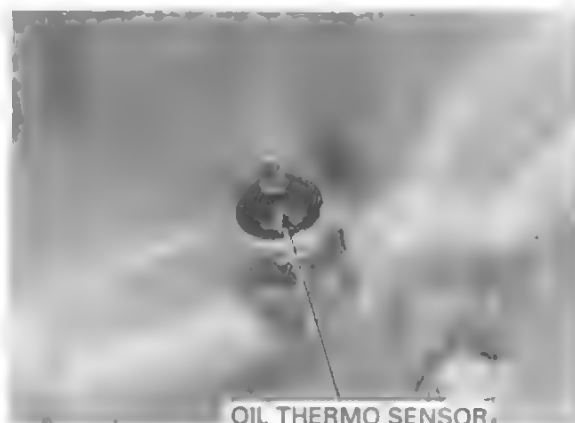
## INSTALLATION

Install the oil thermo sensor in the rear crankcase and tighten it to the specified torque.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

Connect the sensor wire.

Fill the crankcase with the recommended oil (page 3-9).



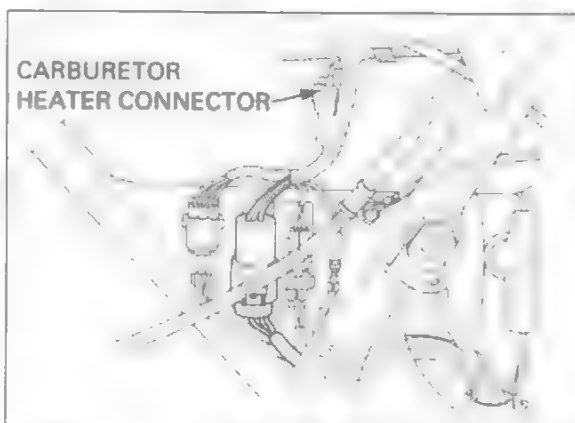
## CARBURETOR HEATER

### INSPECTION

Disconnect the carburetor heater 2P connector.  
Measure the resistance between the Blown/Black and Yellow/Black terminals.

**STANDARD: 13 – 15  $\Omega$  (20°C/68 F)**

If the carburetor heater resistance is out of specification, replace the carburetor heater (section 5).

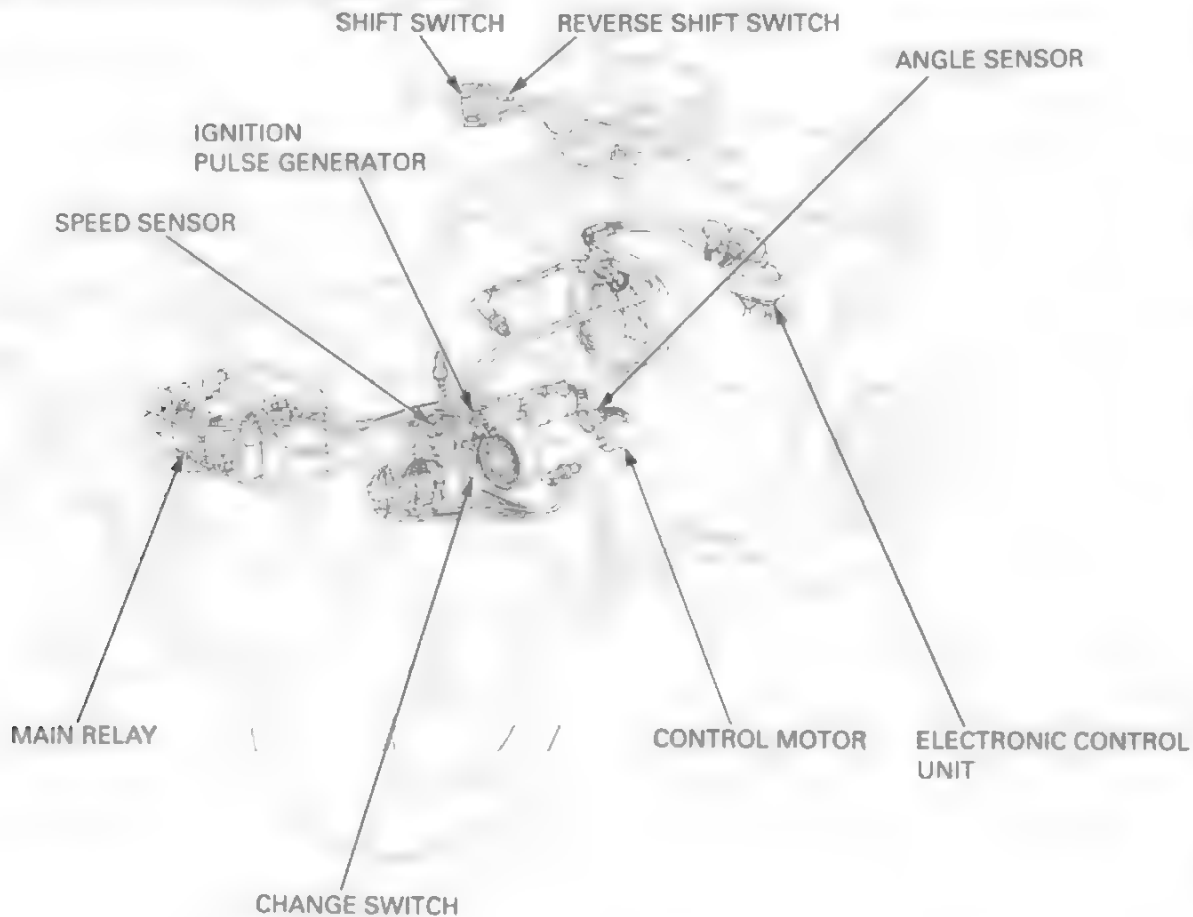


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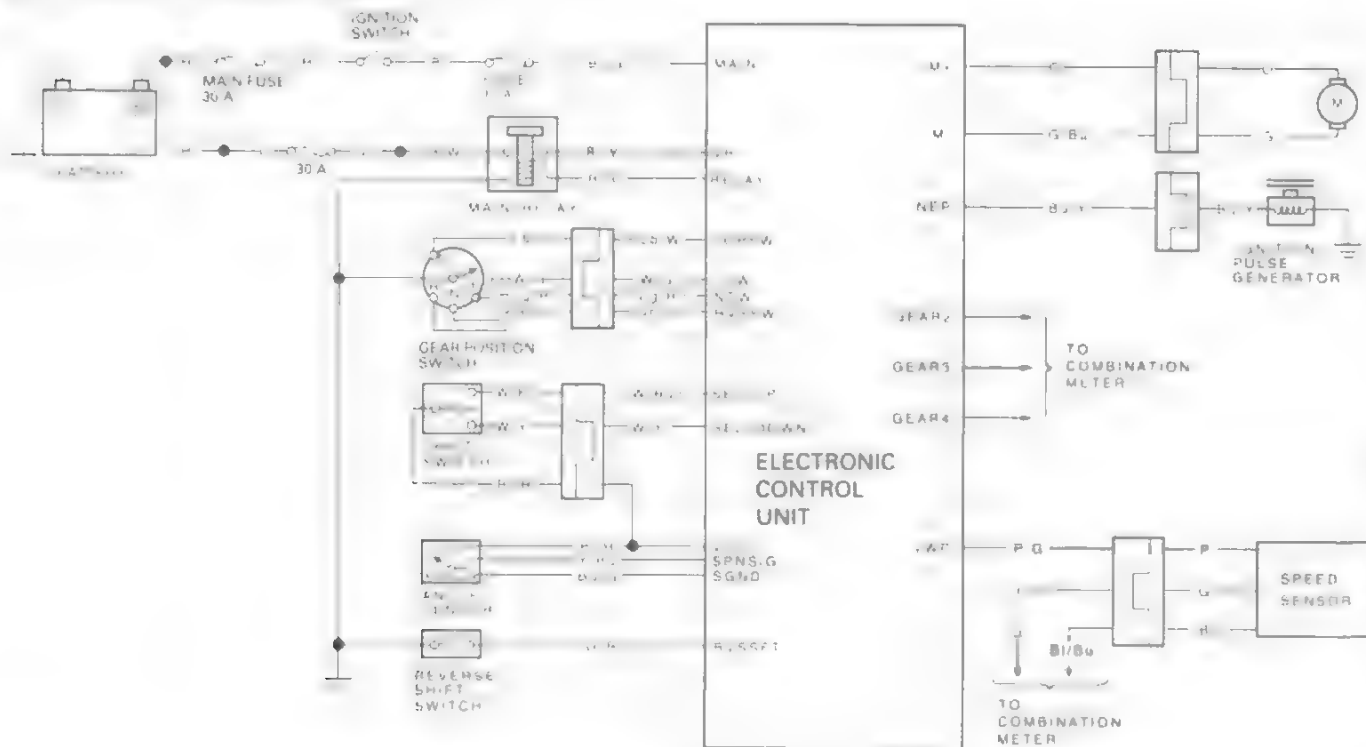
MEMO

# ELECTRIC SHIFT PROGRAM (ESP)

'98 - '01:



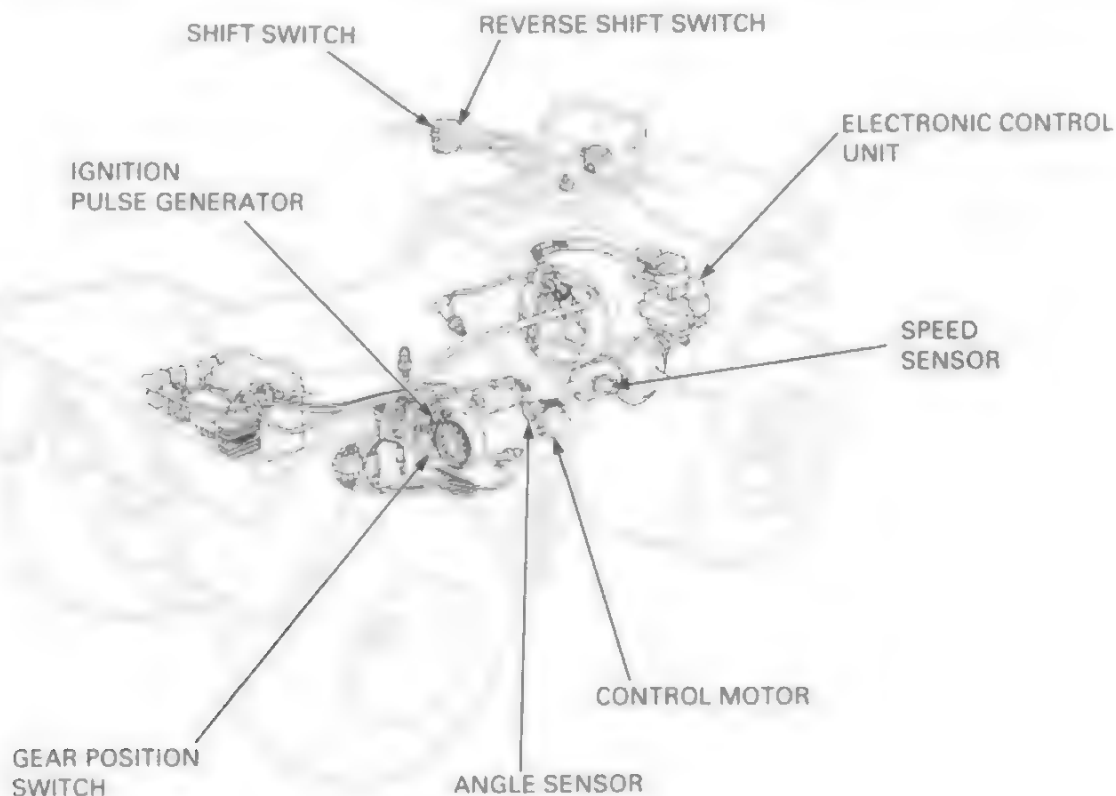
## SYSTEM DIAGRAM ('01)



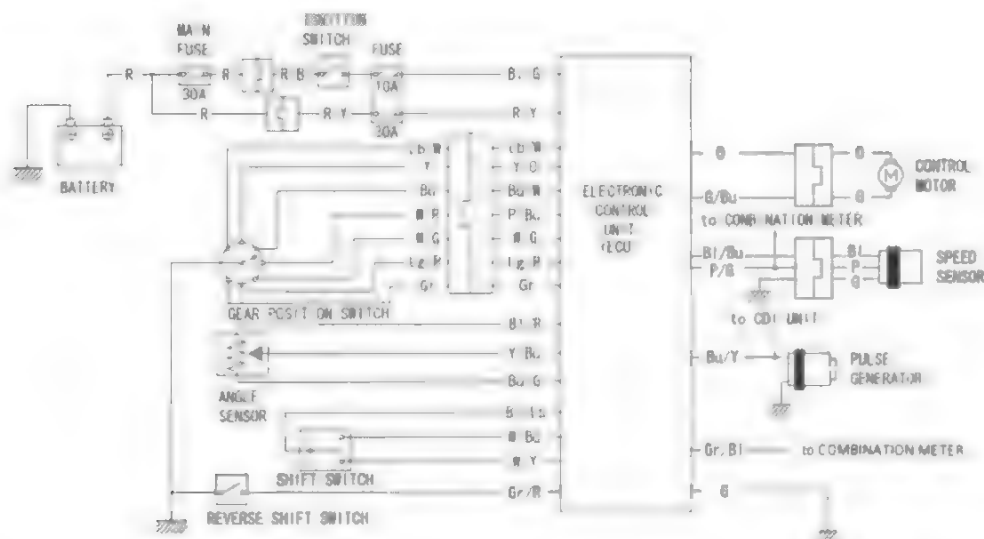
# 21. ELECTRIC SHIFT PROGRAM (ESP)

SYSTEM DIAGRAM	21-0	GEAR POSITION SWITCH INSPECTION	<u>21-30</u>
SERVICE INFORMATION	21-2	SHIFT SWITCH INSPECTION	21-31
TROUBLESHOOTING	21-3	REVERSE SHIFT SWITCH INSPECTION	21-31
ANGLE SENSOR	21-26	MAIN RELAY ('98 - '01)	21-31
CONTROL MOTOR	21-28		

After '01:



SYSTEM DIAGRAM (After '01)





### SERVICE INFORMATION

#### GENERAL

- For electric shift program (ESP) system location, see page 21-0 and 21-1.
- When servicing the electric shift program (ESP), always follow the steps in the troubleshooting flow chart (page 21-3, 14).
- Control motor service can be done with the engine installed in the frame.
- The speed sensor digital pulse signal is sent to the control unit. For speed sensor inspection, see section 20.
- Use a digital tester for electric shift program (ESP) system inspection.
- Check for loose connectors, especially at the shift motor and ESC.
- Ensure that all connectors are clean, dry and free of corrosion (repack with dielectric grease).
- Before troubleshooting the ESP, make sure the vehicle will shift using the gear change tool. If not, check gear shift linkage section 9.
- If the unit has been submerged in water above the control motor, verify proper control motor operation.
- Ensure that the angle sensor is operating properly (page 21-25).

#### TORQUE VALUE

Angle sensor

6 N•m (0.6 kgf•m, 4.3 lbf•ft)

## TROUBLESHOOTING ('98 – '01)

### TROUBLESHOOTING FEATURE

When the Electronic Control Unit detects a system abnormality, the Electronic Control Unit has a built-in self-diagnostic function that stops the Electronic Shift (ES) activity or resets the system entirely (just as when the ignition switch is turned from OFF to ON). The Electronic Control Unit does not have the capability to inform the operator of the cause of the abnormality, except that the ES function stops immediately when the Electronic Control Unit detects a failure condition. As the 2nd, 3rd, and 4th gear positions are activated by signals from the Electronic Control Unit, when the engine stops, the display will only show dashes (– –) for those positions. The gear position can only be determined by manually shifting the transmission (if possible, using the shifting tool that comes with the vehicle) into, **reverse, neutral first or fifth gear** (which appear on the display).

When the Electronic Control Unit is in "failure" mode, the shift function is immediately deactivated and will remain so until the main switch is turned to the OFF position. When the main switch is turned back ON, the Electronic Control Unit will be reactivated unless it immediately detects another FAIL condition. If the Electronic Control Unit does not immediately detect a FAIL condition, the operator can then document the conditions that lead to another "failure" mode.

### BEFORE TROUBLESHOOTING

When the operator detects an abnormality, check the following before proceeding with the diagnosis:

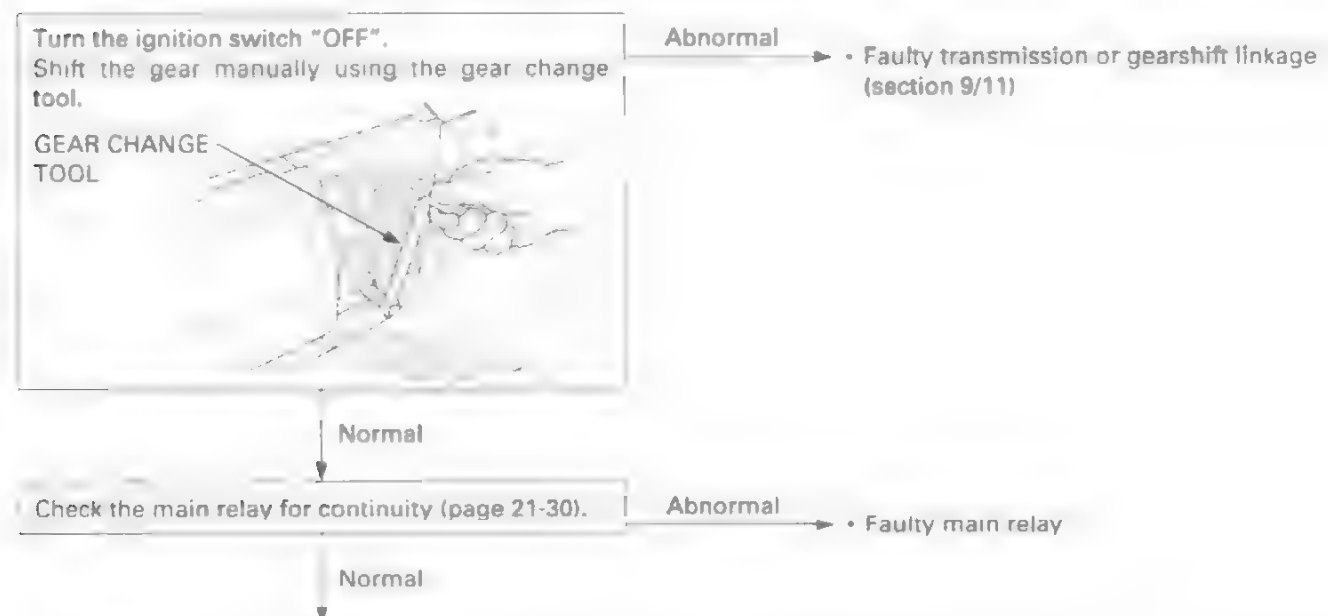
- Make sure the battery is fully charged and in good condition.
- Clutch adjustment
- Inquire the operator about the following.
  1. How often did the abnormality occur?
  2. Vehicle speed road situation (level, climbing and etc.), engine revolution
  3. Mileage
  4. Clutch maintenance history

#### Procedure for "Fail" recurrence

Attempt to recreate the "Fail" situation from information from the operator and record the vehicle speed, engine revolution and shift position. Proceed with the diagnosis from this information.

### ELECTRIC SHIFT DOES NOT OPERATE

- Inspect the following before diagnosing system.
  - Make sure the battery is fully charged and in good condition.
  - Clutch adjustment
  - Blown main (30A), motor (30A) or sub fuse (light (15A), ignition (10A))

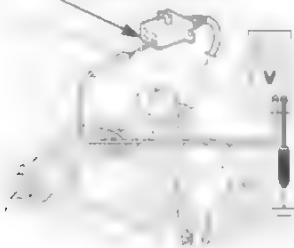


## ELECTRIC SHIFT PROGRAM (ESP)

Disconnect the main relay 4P connector.

With the ignition switch "OFF", measure the voltage between the Red/White connector terminal of the wire harness side and body ground.

MAIN RELAY 4P CONNECTOR



CONNECTION : Red/White (+) - Body ground (-)  
STANDARD : 10 V minimum

Out of range

- Open circuit in Red/White wire
- Loose or poor contacts of related terminal
- Blown shift motor fuse

Normal

Disconnect the main relay 4P connector.

With the ignition switch "OFF", check for the continuity between the Green connector terminal of the wire harness side and body ground.

MAIN RELAY 4P CONNECTOR



CONNECTION : Green (+) - Body ground (-)  
STANDARD : Continuity

Out of range

- Open circuit in Green wire
- Loose or poor contacts of related terminal

Normal

Disconnect the control unit 5P and main relay 4P connector.

Check for the continuity between the control unit 5P connector and main relay 4P connector terminal of the wire harness side.

CONNECTION : Red/Yellow - Red/Yellow  
Black/Orange - Black/Orange

STANDARD: Continuity

Reconnect the two connectors.

Abnormal

- Open circuit in related wire
- Loose or poor contacts of related terminal

Normal

Turn the ignition switch "OFF".  
Disconnect the control unit 16P (black) connector.

With the ignition switch "ON", measure the voltage between the Black/Green connector terminal of the wire harness side and body ground.



ECU 16P (BLACK) CONNECTOR

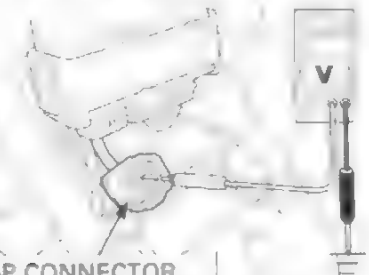
CONNECTION: Black/Green (+) - Body ground (-)  
STANDARD: 11 V minimum

Out of range

- Open circuit in Black/Green wire
- Loose or poor contacts of related terminal

Normal

Connect the control unit 16P connector.  
Turn the ignition switch "OFF".  
Disconnect the control unit 5P connector.  
Install a jumper wire between the Black/Orange terminal of the control unit 5P connector (harness side) to the positive battery terminal.  
With the ignition switch "ON", measure the voltage between the Red/Yellow connector terminal of the wire harness side and body ground.



ECU 5P CONNECTOR

CONNECTION: Red/Yellow (+) - Body ground (-)  
STANDARD: 11 V minimum

Abnormal

- Open circuit in Red/Yellow wire
- Loose or poor contacts of related terminal

Normal

Disconnect the control unit 5P connector.

With the ignition switch "OFF", check for the continuity between the Green connector terminal of the wire harness side and body ground.



CONTROL UNIT 5P CONNECTOR

CONNECTION: Green (+) - Body ground (-)  
STANDARD: Continuity

Abnormal

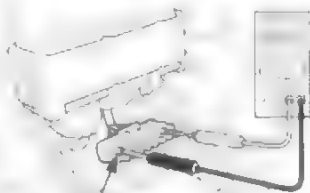
- Open circuit in Green wire
- Loose or poor contacts of related terminal

Normal

## ELECTRIC SHIFT PROGRAM (ESP)

Connect the ECU 5P connector.  
Disconnect the control unit 16P connector.

With the ignition switch "OFF", measure the resistance between the Black/Red and Blue/Green connector terminal of the wire harness side.



CONTROL UNIT 16P (BLACK) CONNECTOR

CONNECTION : Black/Red (+) - Blue/Green (-)  
STANDARD : 4-6 k $\Omega$

Abnormal

Disconnect the control unit 16P and angle sensor 3P (natural) connector.  
Check for continuity between the control unit 16P connector and angle sensor 3P connector terminal of the wire harness side.

CONNECTION:

Black/Red - Black/Red

Yellow/Blue - Yellow/Blue

Blue/Green - Blue/Green

STANDARD : Continuity

Not Continuity

- Open circuit in related wire
- Loose or poor contacts of related terminal

Continuity

Normal

Connect the control unit 16P connector.  
Disconnect the angle sensor 3P (natural) connector.

With the ignition switch "ON", measure the voltage between the Black/Red connector terminal of the wire harness side and body ground.



ANGLE SENSOR 3P CONNECTOR

CONNECTION : Black/Red (+) - Body ground (-)  
STANDARD : 4.75 - 5.25 V

Abnormal

Disconnect the control unit 16P and angle sensor 3P (natural) connector.

Check for continuity between the control unit 16P connector and angle sensor 3P connector terminal of the wire harness side.

CONNECTION:

Black/Red - Black/Red

STANDARD : Continuity

Normal

- Faulty control unit

Abnormal

- Open circuit in related wire
- Loose or poor contacts of related terminal

Normal

Remove the angle sensor (page 21-26).

Visually inspect the angle sensor shaft hole and gear shift spindle for damage.



ANGLE SENSOR  
SHAFT HOLE

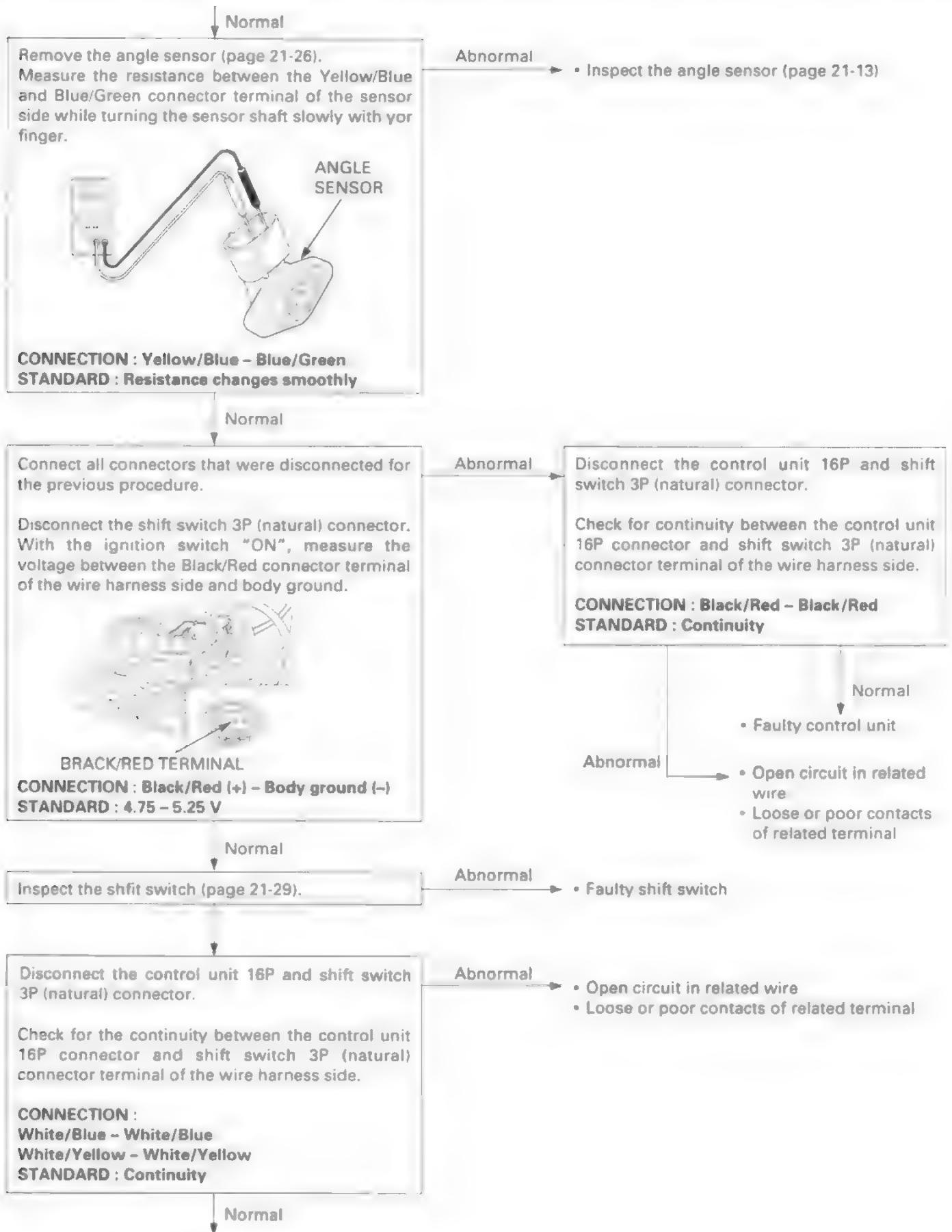


GEAR SHIFT  
SPINDLE

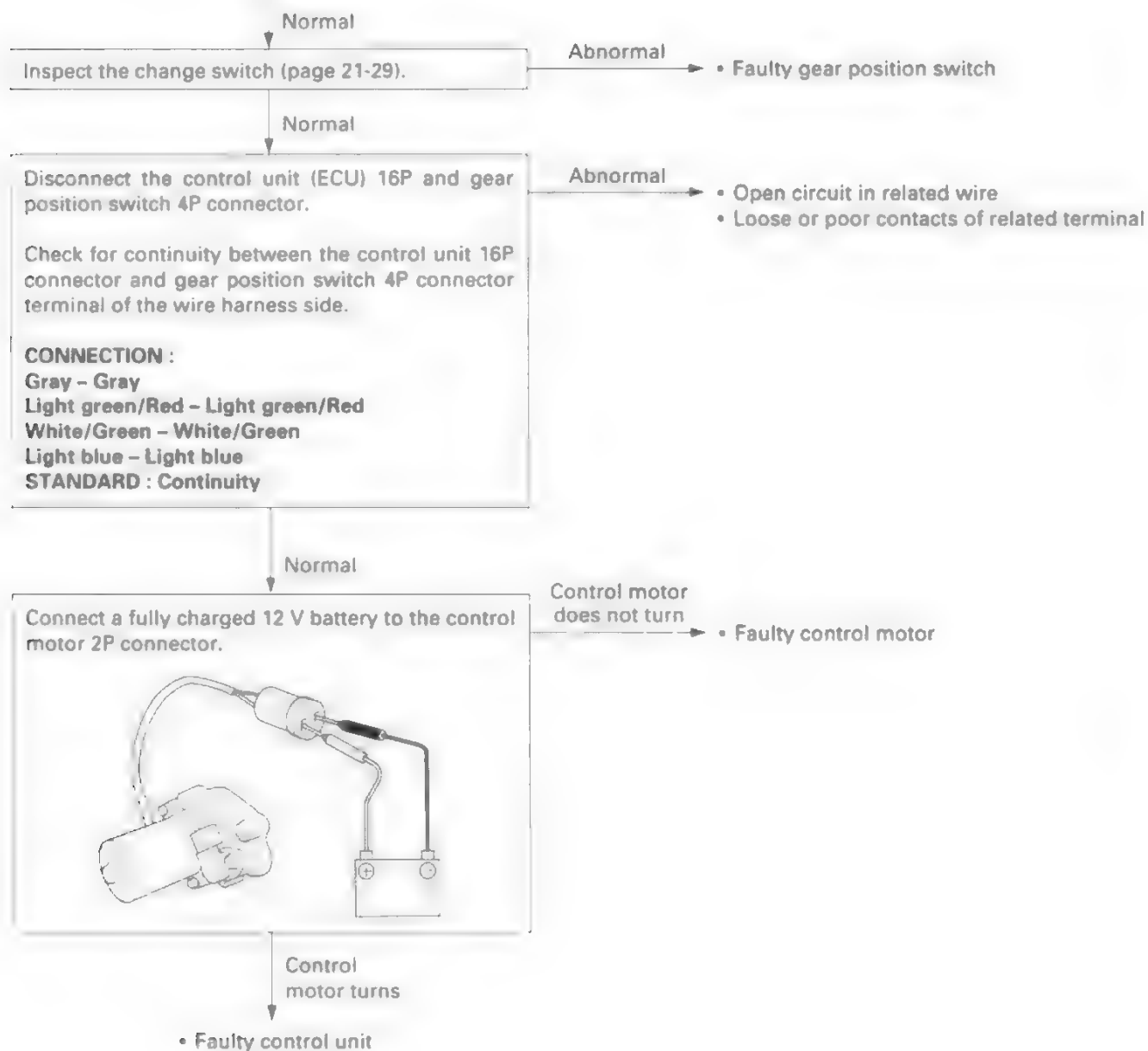
Abnormal

- Replace the angle sensor (page 21-26)
- Replace the sub gearshift spindle (section 9)

Normal



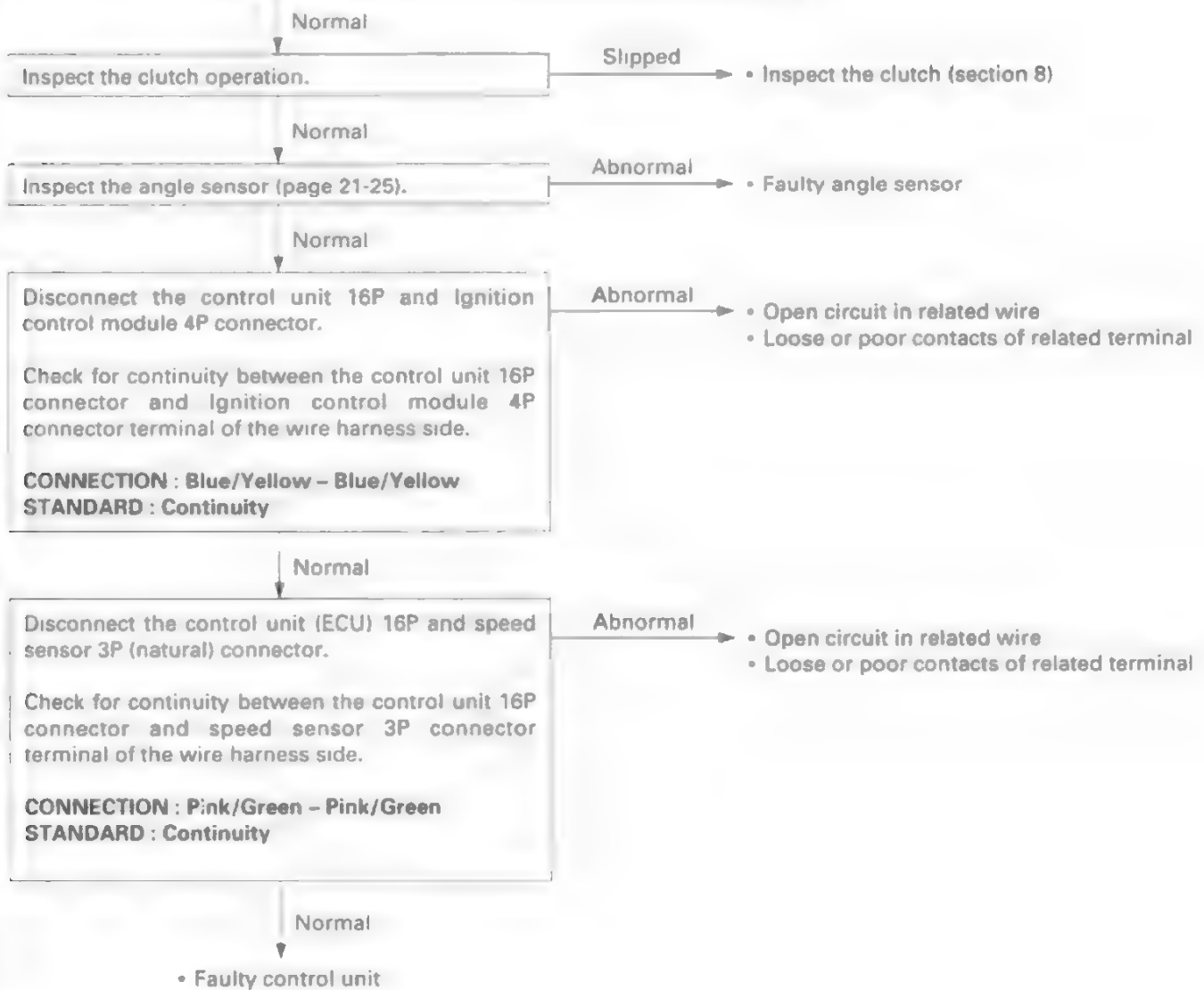
## ELECTRIC SHIFT PROGRAM (ESP)



## ELECTRIC SHIFT MALFUNCTION DURING VEHICLE OPERATION

- Inspect the following before diagnosing the system.
  - The engine run normally
  - Speedometer operates normally

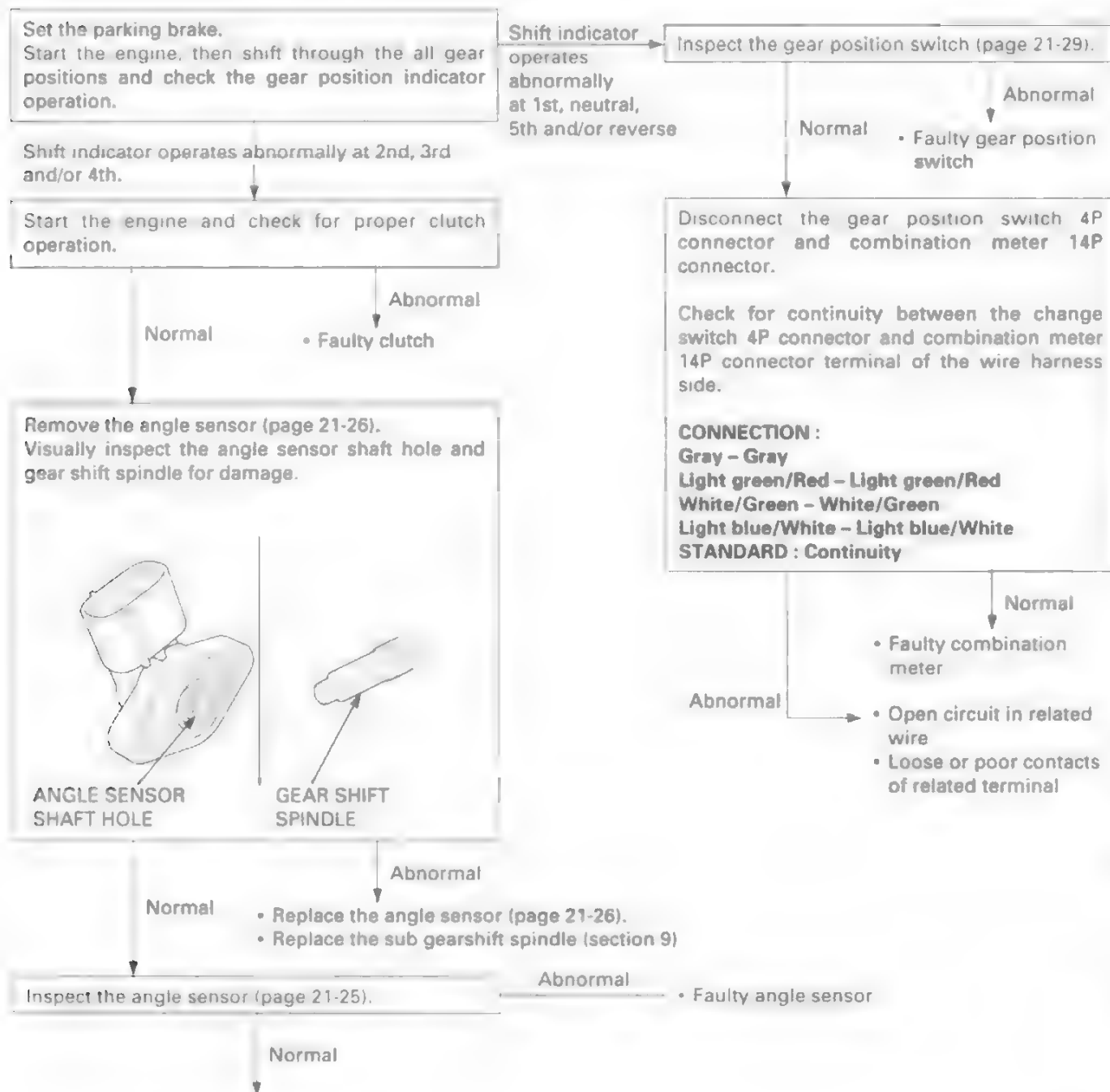
Refer to Electric Shift Does Not Operate troubleshooting section (page 21-3).

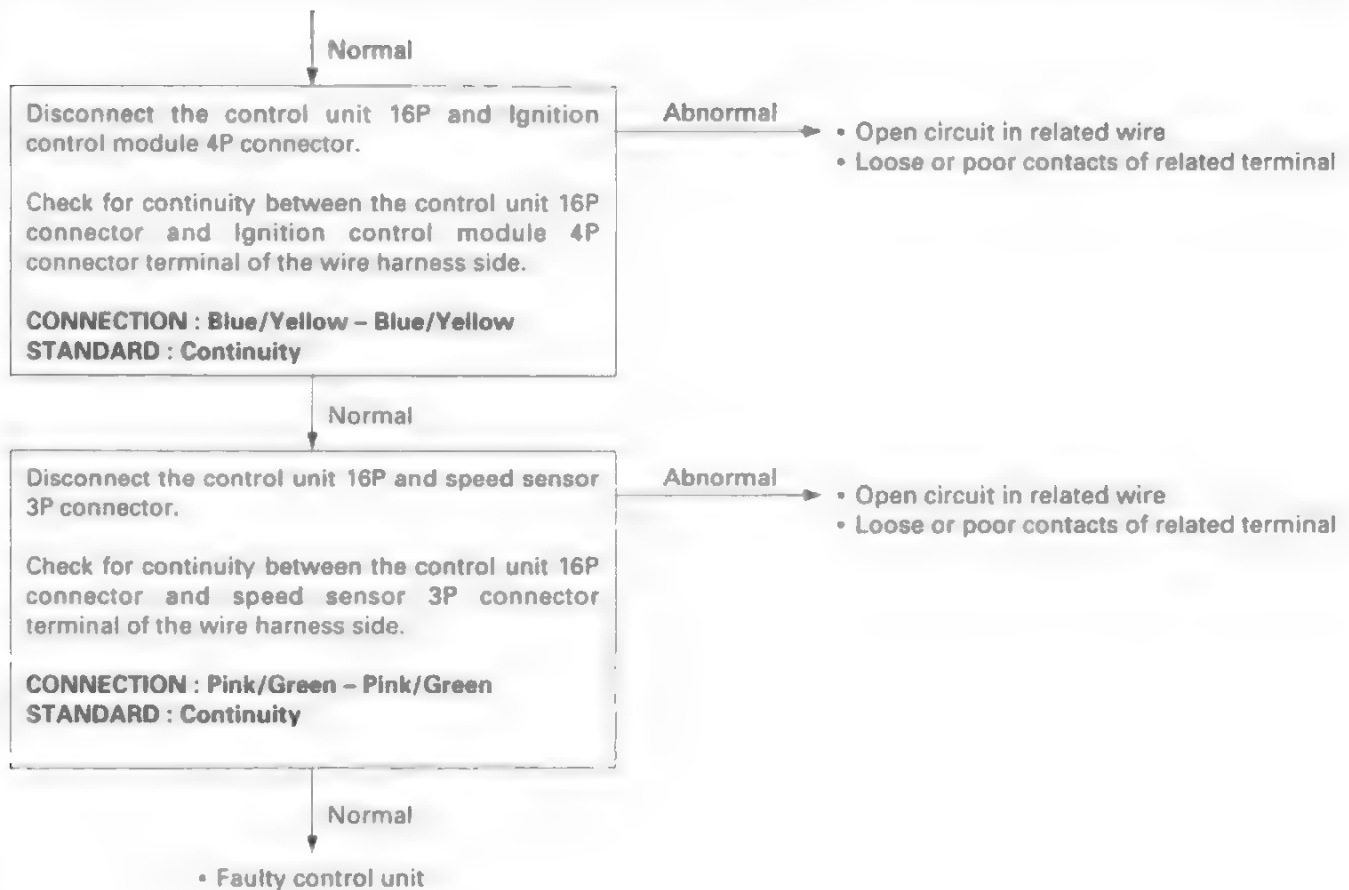




## GEAR POSITION INDICATOR OPERATES ABNORMALLY

- Inspect the following before diagnosing the system.
  - Make sure the battery is fully charged and in good condition.
  - Clutch adjustment
  - Blown main (30A), motor (30A) or sub fuse (Light (15A), ignition (10A)).
  - The engine runs normally
  - Speedometer operates normally

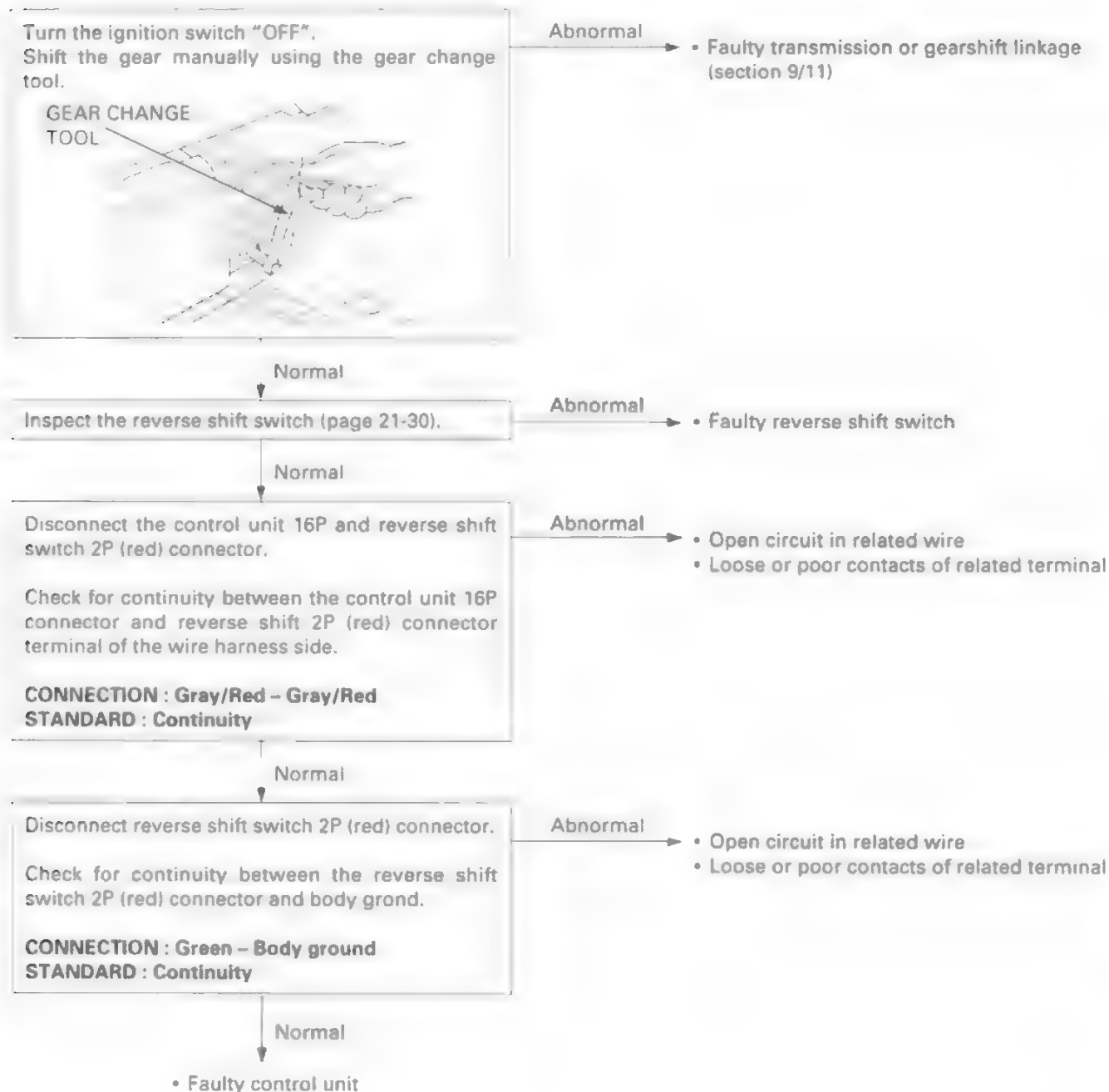




## ELECTRIC SHIFT PROGRAM (ESP)

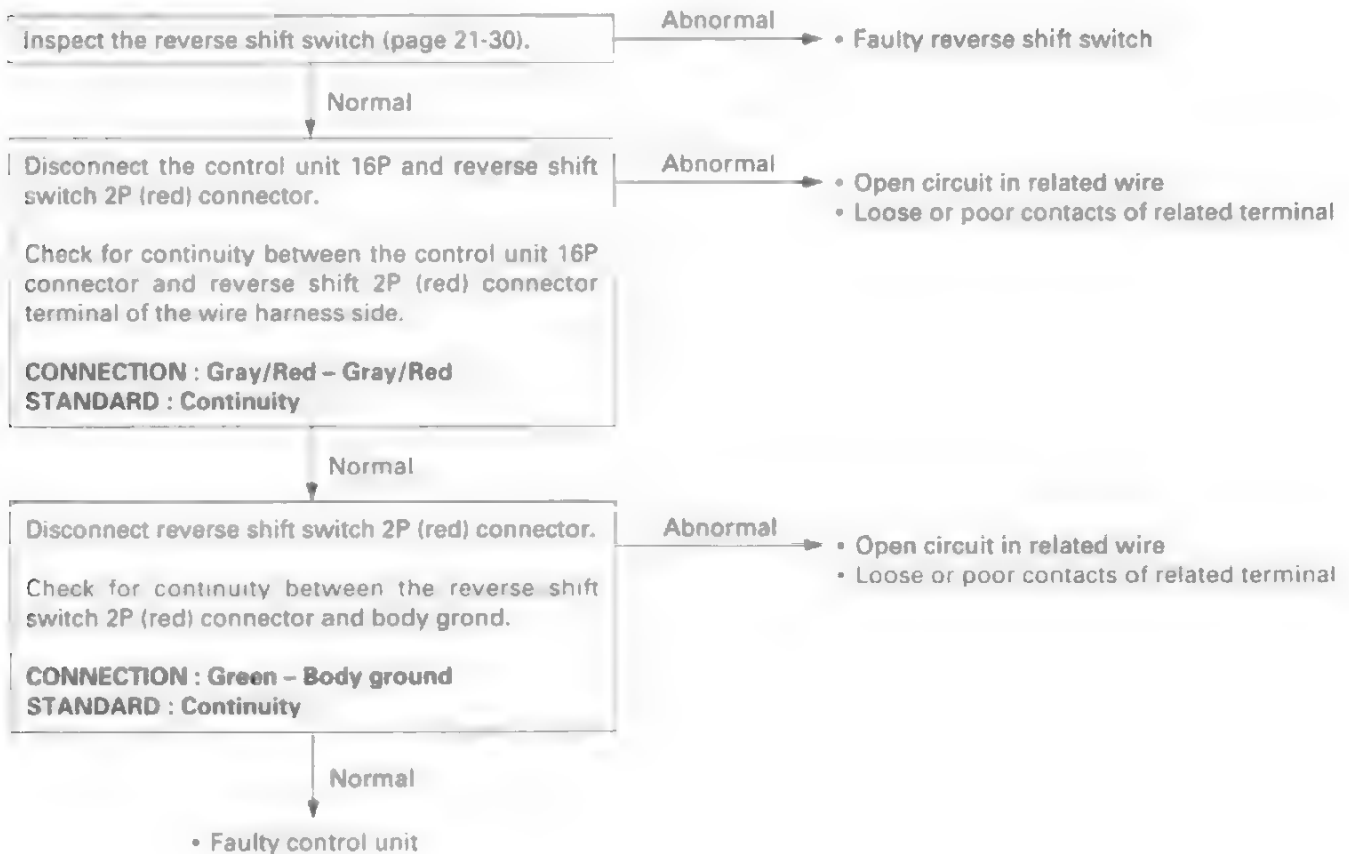
### ELECTRIC SHIFT DOES NOT OPERATE WHEN ENGAGING THE REVERSE GEAR

- Inspect the following before diagnosing the system.
  - Make sure the battery is fully charged and in good condition.
  - Clutch adjustment
  - Blown main (30A), motor (30A) or sub fuse (Light (15A), ignition (10A)).



**CONTROL MOTOR TURNS WHEN THE SHIFT SWITCH IS PUSHED DOWN WITH THE REVERSE SELECTOR NOT OPERATED**

- Inspect the following before diagnosing the system.
  - Make sure the battery is fully charged and in good condition.
  - Blown main (30A), motor (30A) or sub fuse (Light (15A), ignition (10A))



# TROUBLESHOOTING (After'01)

## BEFORE TROUBLESHOOTING

When the Electric Control Unit (ECU) detects a system abnormality, the ECU has a built-in self-diagnostic function that stops the Electric Shift (ES) system or resets the systems entirely (just as when the ignition switch is turned from "OFF" to "ON"). If the ECU detects an ES system failure, the ECU stops the ES system function and records a problem code. The ES system will not operate, even after the ignition switch is turned to "OFF".

To reset the ES system, turn the ignition switch from "ON" to "OFF" and back to "ON" again. However, if the ECU still detects a problem, it will continue to deactivate the ES system function. When this occurs, the gear position indicator will blink a certain number of times to indicate the appropriate problem code.

The ECU is able to record system failures and outputs these as problem codes that are shown on the indicator (i. e., the "N" blinks a designated number of times).

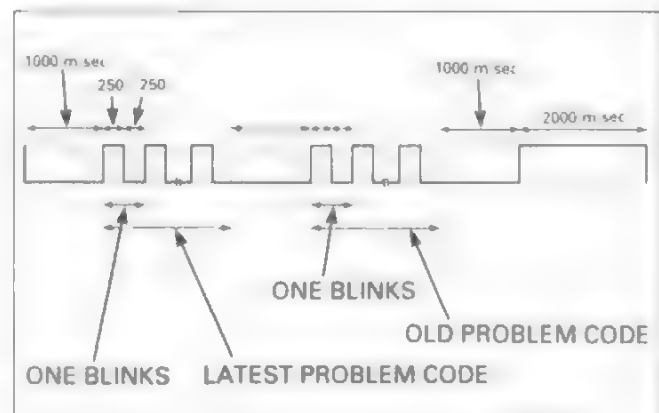
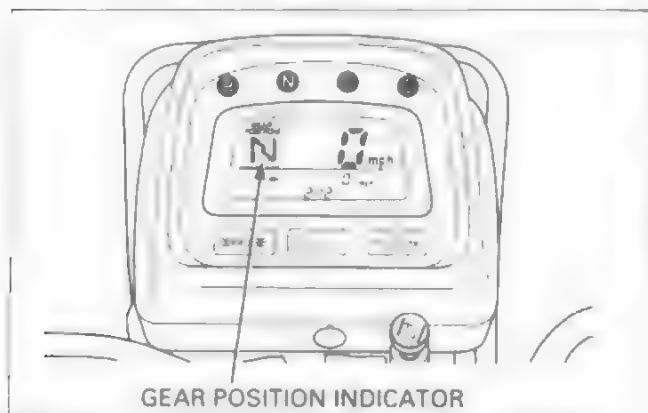
## TROUBLESHOOTING PROCEDURE

When the operator detects an abnormality, check the following before proceeding with the diagnosis:

1. Check the battery voltage (minimum spec. 12.4 V) and any blown fuses.
2. Turn the ignition switch to "ON". If the gear indicator blinks, record the number of blinks, since this indicates the type of failure. Then troubleshoot the indicated failure. Refer to the appropriate problem code within this chapter.

If no ES system failure occurs (the indicator does not blink), perform the following:

1. Make sure the gear position indicator blinked codes to the user. Check the problem code as described below.
  - a) Turn the ignition switch to "OFF".
  - b) Place the transmission in neutral.
  - c) Apply the parking brake so the vehicle does not move.
  - d) Turn the ignition switch to "ON" while pushing both electric shift switches (UP and DOWN). Make sure the "N" appears to indicate that the transmission is in neutral.
  - e) Wait 5 seconds and then push both electric shift switches again, and hold them for at least 3 seconds.
2. If the code number could not be checked (the indicator did not blink), repeat steps 2 and 4.
3. If a failure is still not indicated (i. e., the "N" does not blink), the problem is as follows:
  - a) Electric shift does not operate (page 21-16) and/or
  - b) Faulty gear indicator (e. g., does not indicate the problem, keeps indicating the same gear position, indicates a different gear position than what the transmission is in)
4. After performing the above troubleshooting steps and repairing the problem, delete the codes as follows:
  - a) Turn the ignition switch to "OFF".
  - b) Place the transmission in neutral.
  - c) Apply the parking brake so the vehicle does not move.
  - d) Turn the ignition switch to "ON" while pushing both electric shift switches (UP and DOWN). Make sure the "N" appears to indicate that the transmission is in neutral.
  - e) Wait 5 seconds and then push both electric shift switches again, and hold them for at least 3 seconds.
  - f) While the indicator is showing the problem code (i. e., blinking with the transmission in neutral), push both electric shift switches to delete the problem code number.
  - g) Turn the ignition switch to "OFF".



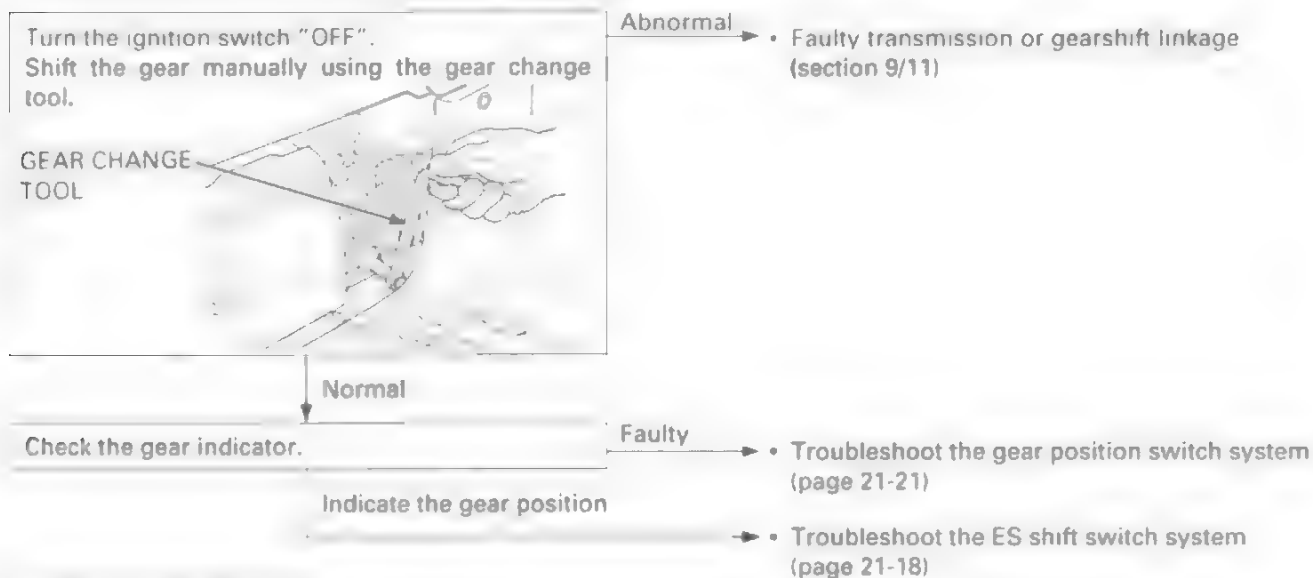
**Diagnosis table**

Gear indicator blinks	Check part and system	Probable faulty part	Refer to page
0	No problem	No problem	
1	EUC (writing and recoding circuit)	ECU	21-18
2	ES shift switch system (up and down)	Shift switch or related wire harness or ECU	21-18
3	Angle sensor system	Angle sensor (abnormal installed) or related wire harness or ECU	21-19
4	Gear position switch system	Gear position switch or related wire harness or ECU	21-21
5	ECU motor driver circuit	ECU	21-22
6	ECU fail-safe relay circuit	ECU	21-23
7	ECU voltage convent circuit	ECU	21-23
8	Angle sensor system	Angle sensor or control motor or related wire harness or ECU	21-19
9	Angle sensor system	Angle sensor (short or open) or related wire harness or ECU	21-19
10	Ignition pulse generator system	Ignition pulse generator or related wire harness	21-24
11	Speed sensor system (vehicle speed)	Speed sensor or related wire harness or ECU	21-25
12	Gear position switch system	Gear position switch or related wire harness or ECU	21-21

## ELECTRIC SHIFT PROGRAM (ESP)

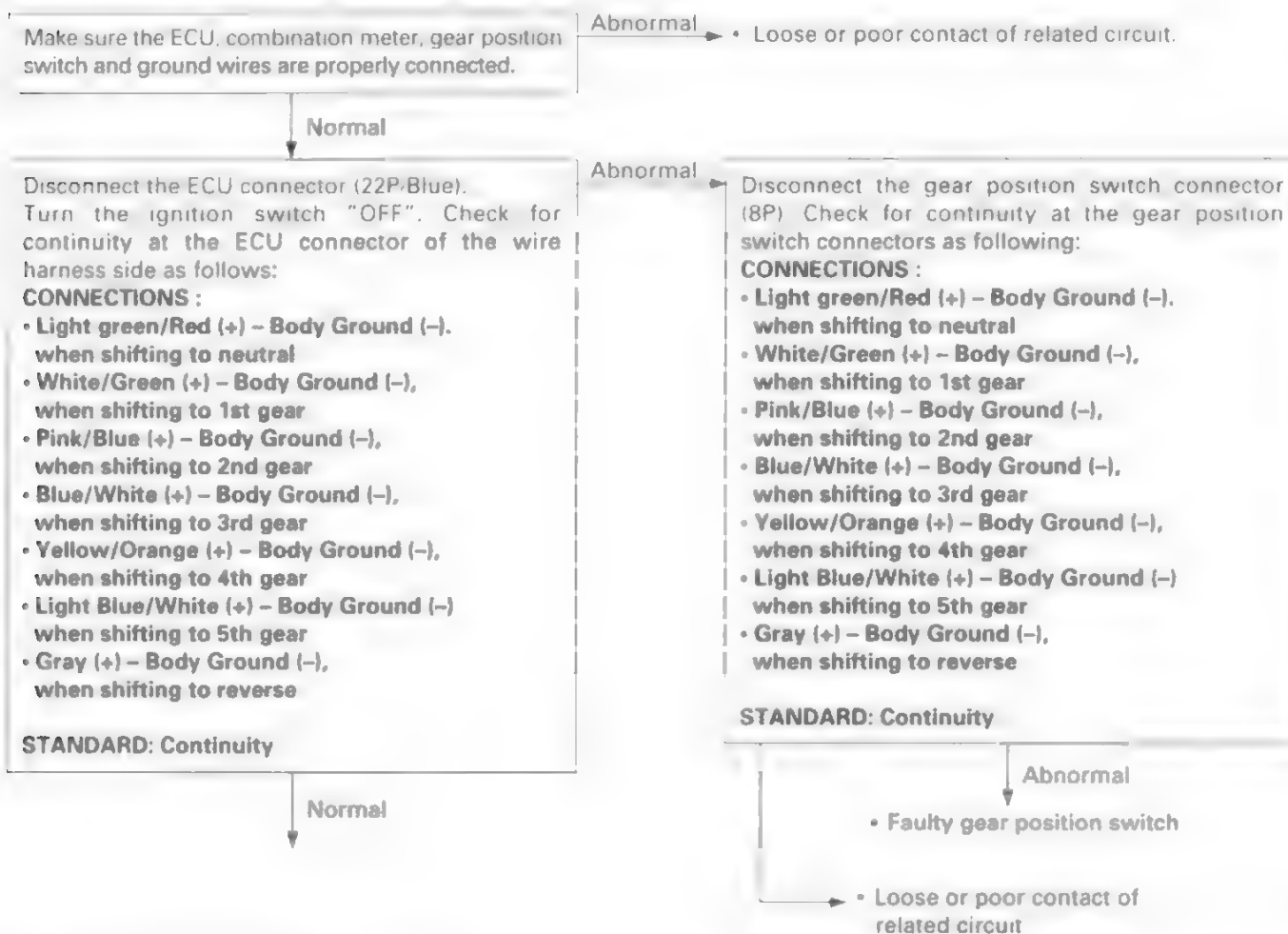
### ELECTRIC SHIFT DOES NOT OPERATE

- Inspect the following before diagnosing the system.
  - Make sure the battery is fully charged and in good condition.
  - Clutch adjustment
  - Blown main (30A), motor (30A) or sub fuse, ignition (10A)

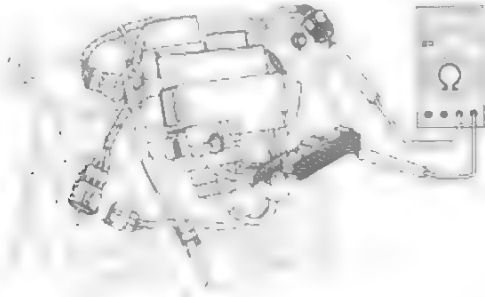


### GEAR INDICATOR PROBLEM

- No indication of gear position
- Keeps indicating same gear position
- Different gear is indicated



Disconnect the combination meter connector (14P).  
Check for continuity of the Gray/Black wire between the ECU connector and the combination meter connector terminals.



**CONNECTION:** Grey/Black (+) – Grey/Black (–)  
**STANDARD:** Continuity

No continuity

- Open circuit in Gray Black wire
- Loose or poor contact of related circuit

Continuity

Shift the transmission into neutral.  
Check for continuity between the Gray/Black terminals of the combination meter and body ground with the ignition switch "ON".



No continuity

- Faulty combination meter

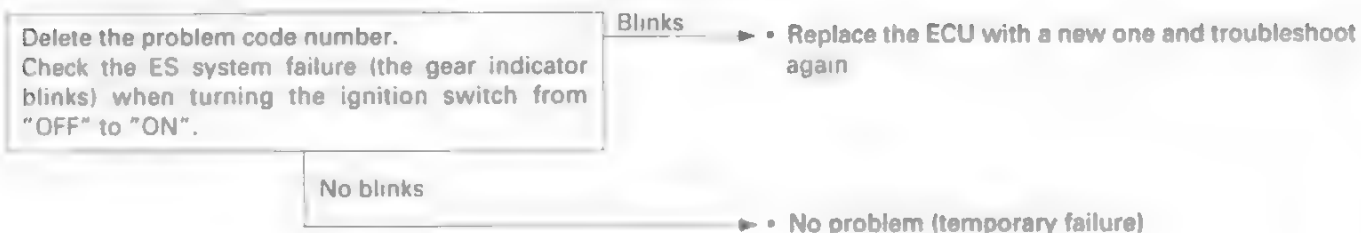
Continuity

- Replace the ECU with a new one and troubleshoot again

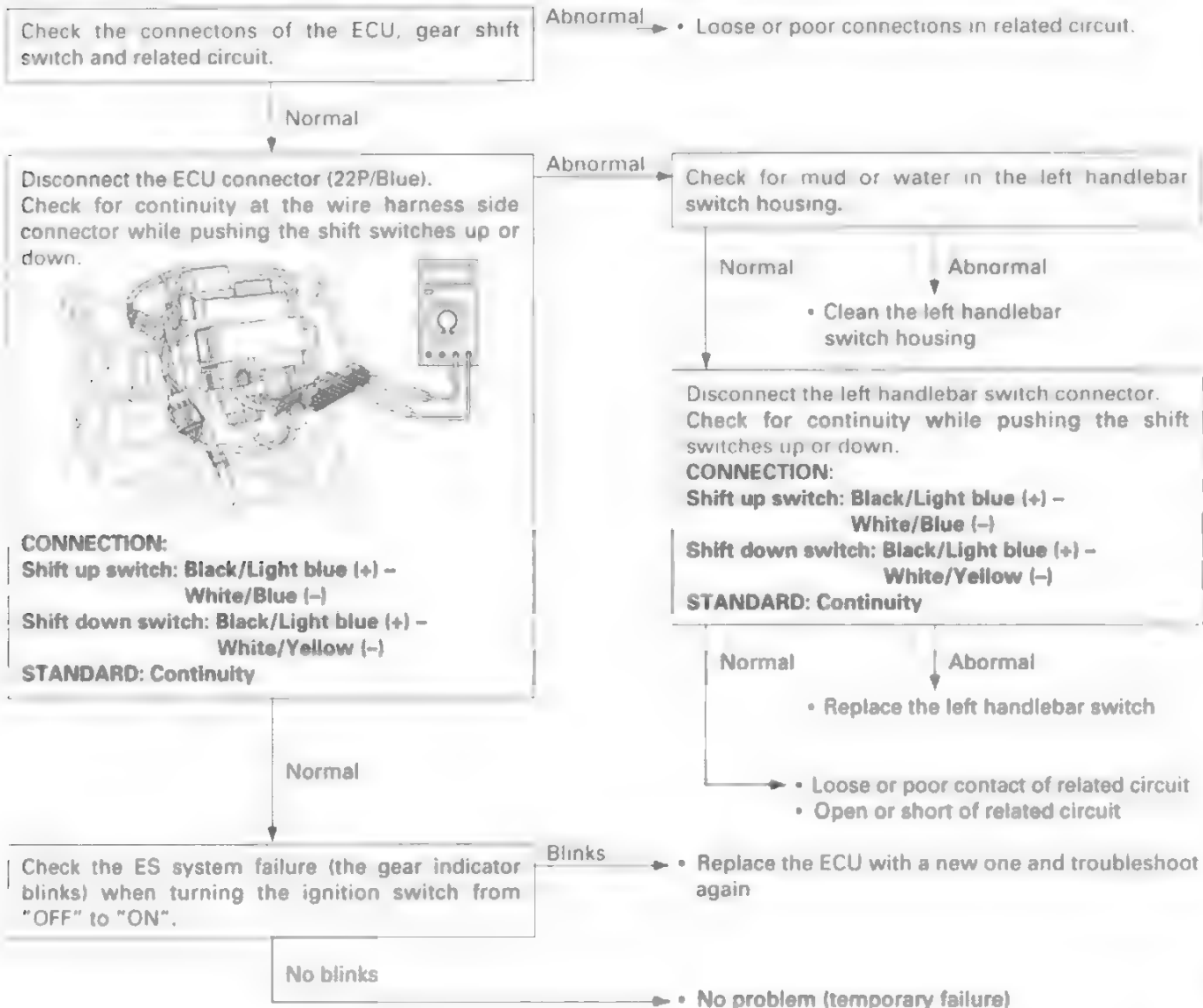


## ELECTRIC SHIFT PROGRAM (ESP)

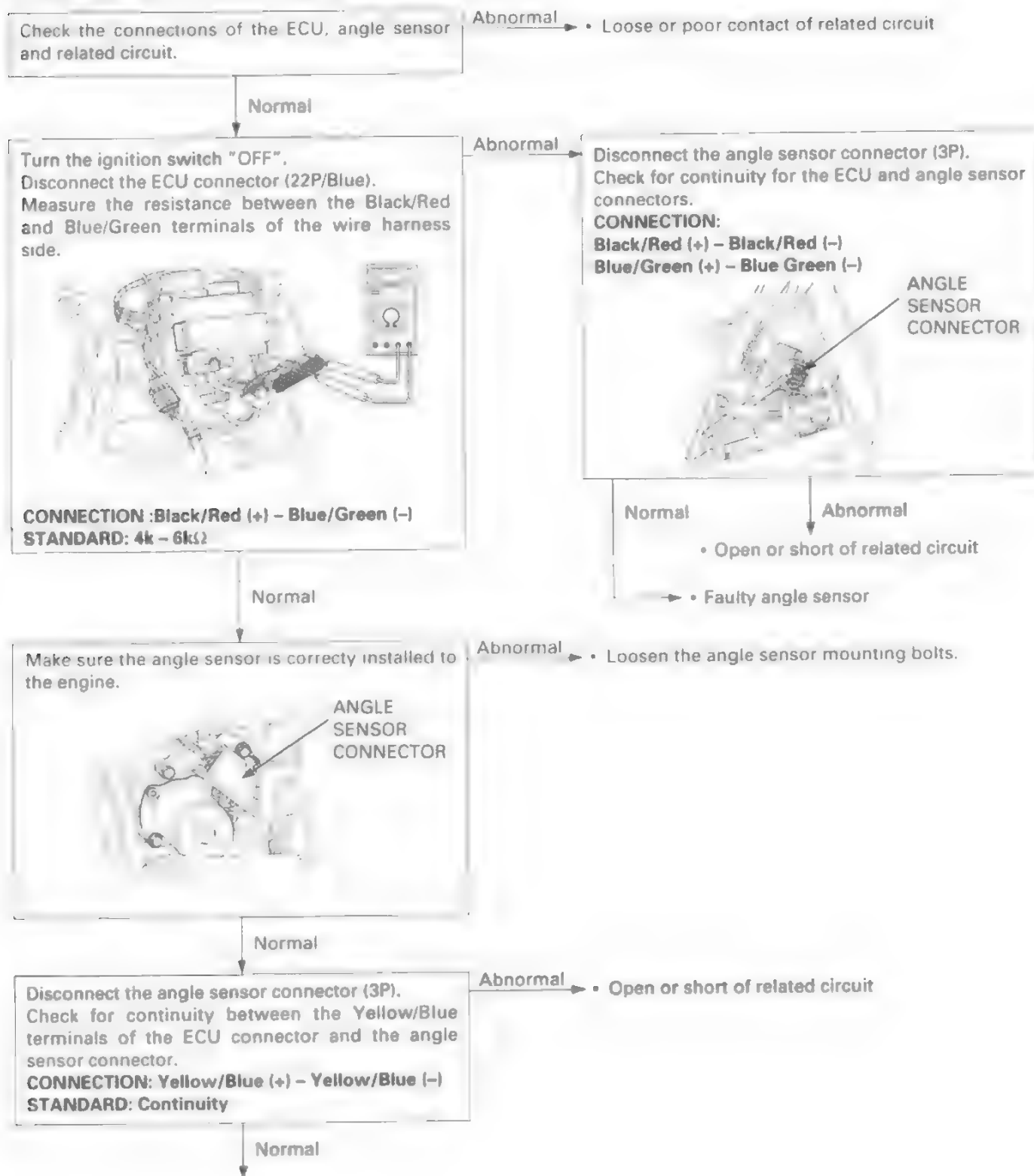
### Problem Code 1: ECU (writing and recording circuit)



### Problem Code 2: ES Shift Switch System (Up And Down)



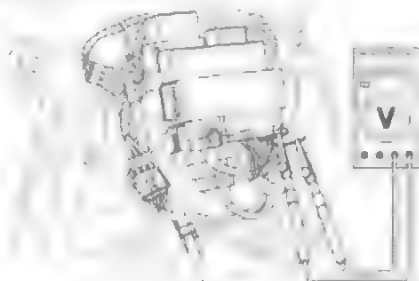
## Problem Code 3, 8, 9: Angle Sensor System



## ELECTRIC SHIFT PROGRAM (ESP)

Connect the ECU connector (22P/Blue) and angle sensor connector (3P).

With the ignition switch "ON", measure the voltage between the Black/Red and the Blue/Green terminals.



**CONNECTION: Black/Red (+) - Blue/Green (-)**  
**STANDARD: 4.75 - 5.25 V**

Abnormal

- Replace the ECU with a new one and troubleshoot again

Normal

Turn the ignition switch "OFF".

Disconnect the ECU connector (22P/Blue). Measure the resistance between the Yellow/Blue and Blue/Green terminals of the wire harness side while shifting through all the gears (1st, 2nd, 3rd, 4th, 5th, Reverse)

**CONNECTION: Yellow/Blue (+) - Blue/Green (-)**  
**STANDARD: 0 - 5 k $\Omega$**

Abnormal

- Faulty angle sensor

Normal

Check the ES system failure (the gear indicator blinks) when turning the ignition switch from "OFF" to "ON".

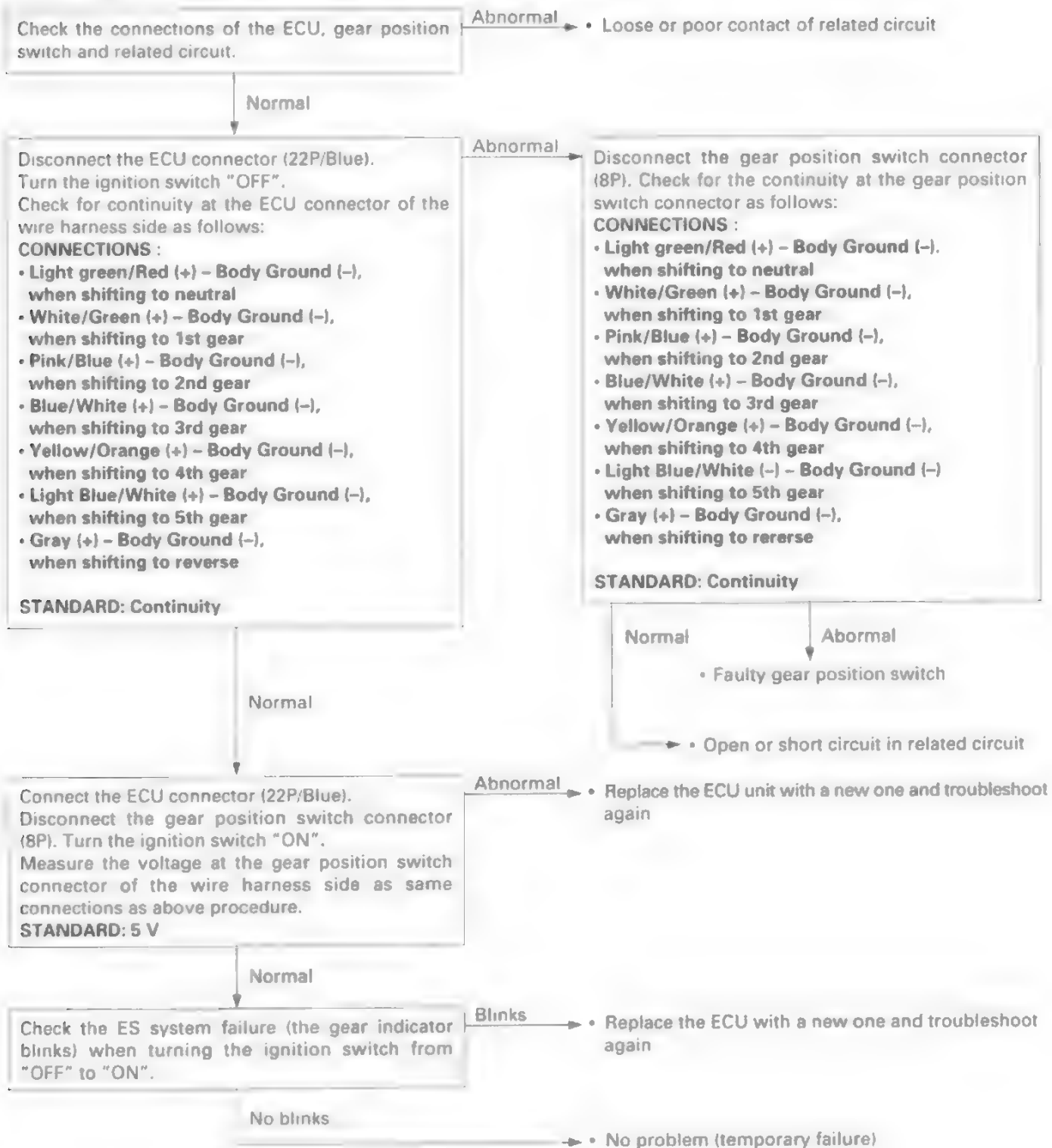
Blinks

- Replace the ECU with a new one and troubleshoot again

No blinks

- No problem (temporary failure)

## Problem Codes 4 or 12: Gear Position Switch System



## ELECTRIC SHIFT PROGRAM (ESP)

### Problem Code 5: ECU Motor Driver Circuit

Check the connections of the ECU, motor and related circuit.

Abnormal

- Loose or poor contact of related circuits

Normal

Disconnect the ECU connector (5P/Brown). Measure the voltage between the Red/Yellow terminal and body ground.



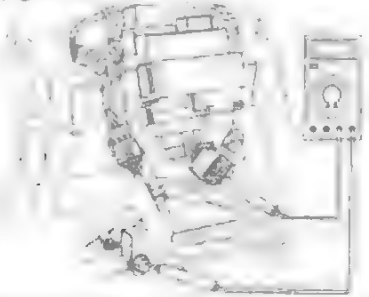
**CONNECTION:** Red/Yellow (+) - Body ground  
**STANDARD:** 11 V minimum

Out of range

- Loose or poor contact of related circuits
- Blown fuse
- Open circuit in Red/Yellow wire

Normal

Check for continuity between the Green terminal and body ground.



**CONNECTION:** Green (+) - Body ground (-)  
**STANDARD:** Continuity

Abnormal

- Loose or poor contact of related circuits
- Open circuit in Green wire

Normal

Disconnect the motor connector (2P). Check for continuity between the ECU connector and motor connector.

**CONNECTIONS:**

Orange (+) - Orange (-)

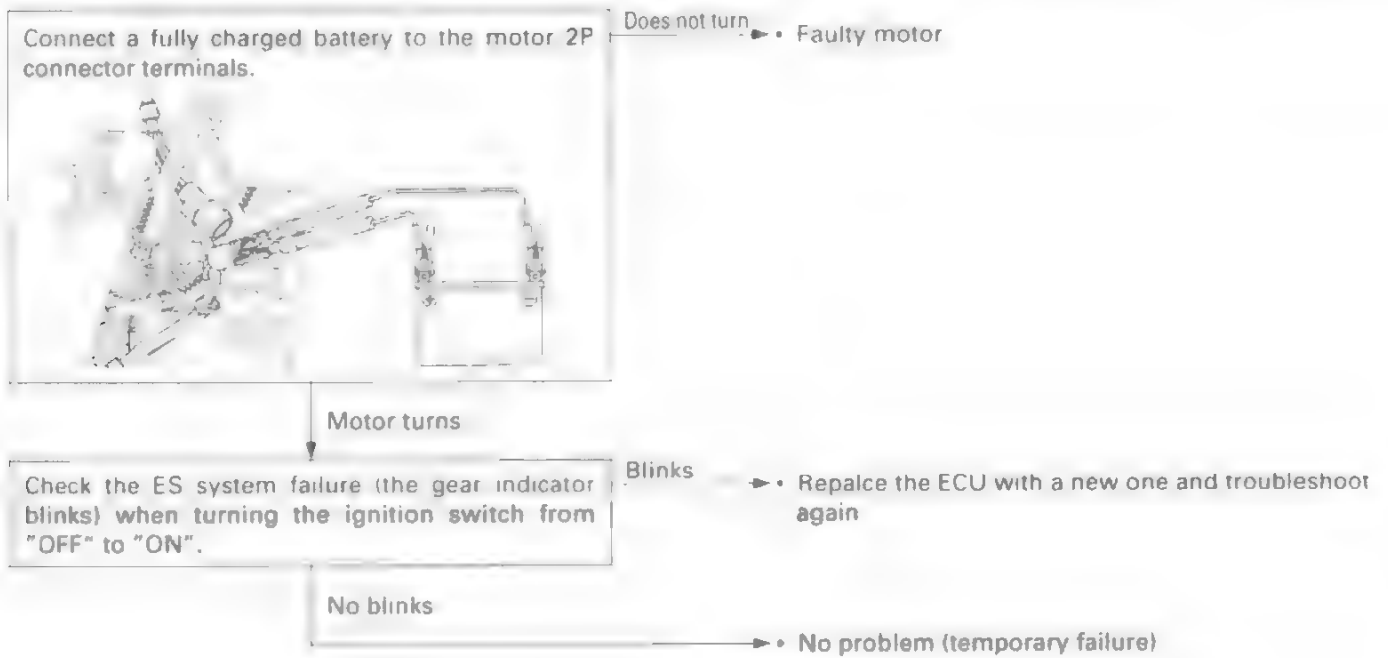
Green/Blue (+) - Green/Blue (-)

**STANDARD:** Continuity

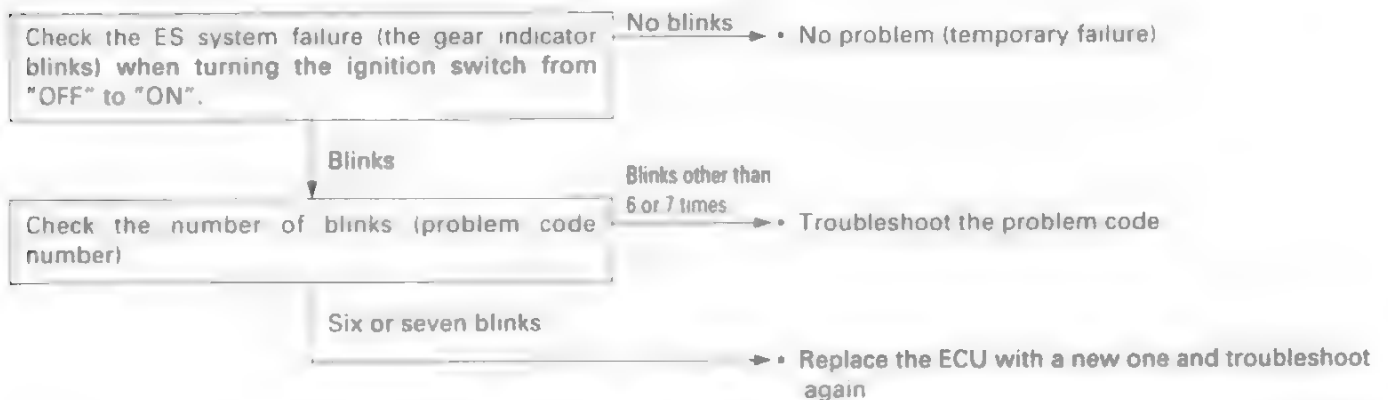
Abnormal

- Loose or poor contact of related circuits
- Open or loose circuit in Orange and/or Green/Blue wire

Normal

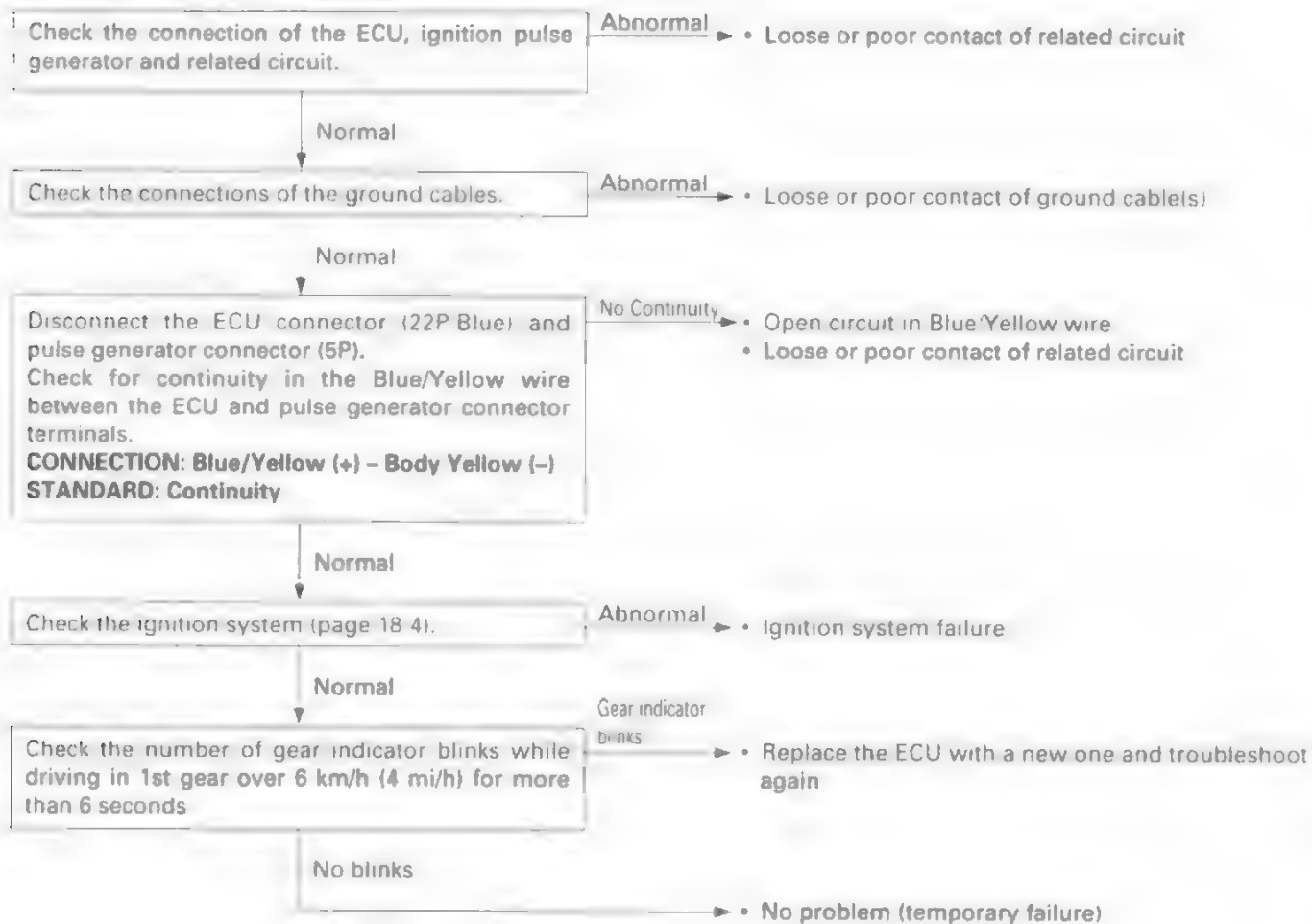


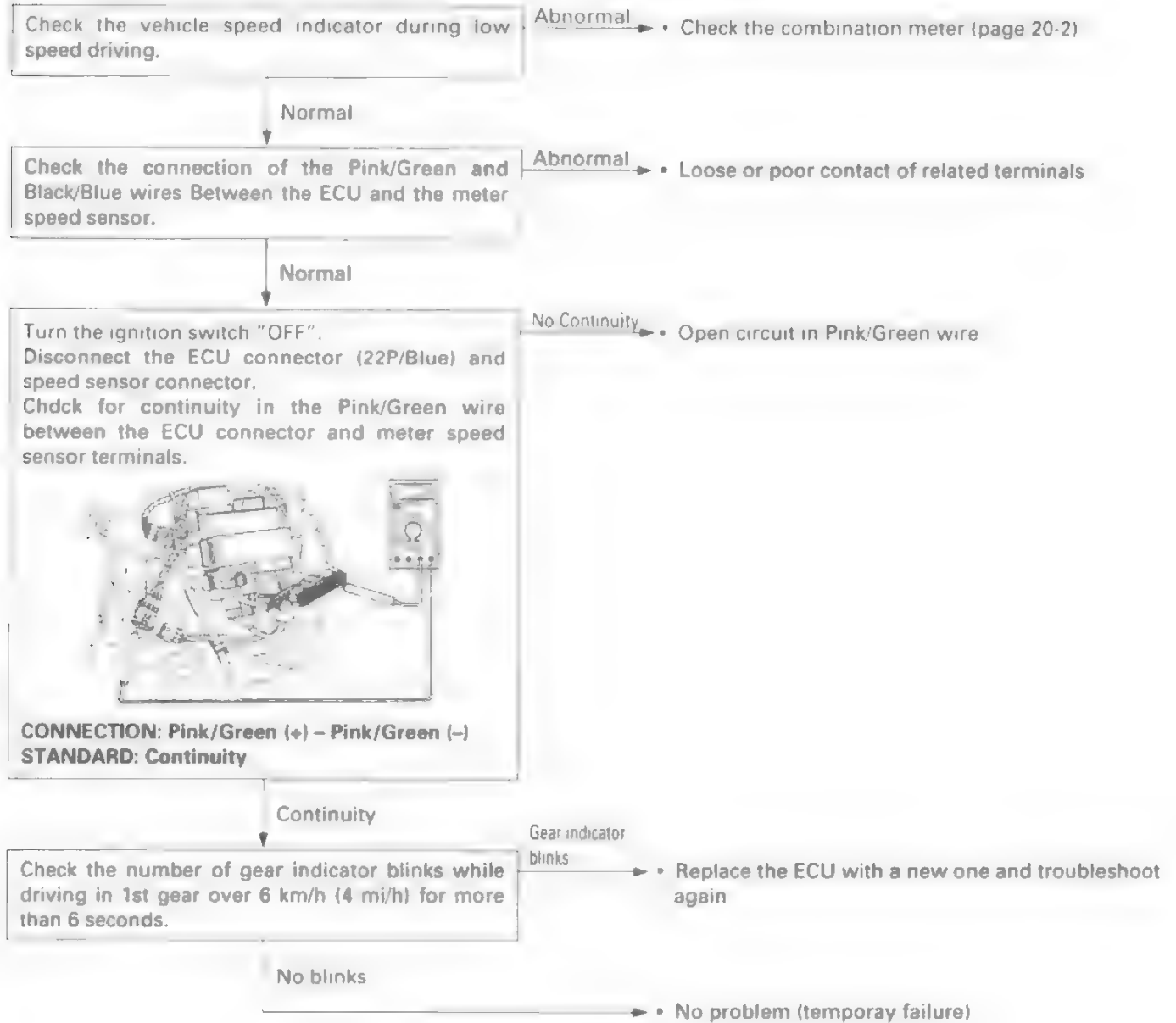
**Problem Code 6: ECU Fail-Safe Circuit or  
Problem Code 7: ECU Voltage Convert Circuit**



## ELECTRIC SHIFT PROGRAM (ESP)

### Problem Code 10: Ignition Pulse Generator System



**Problem Code 11: Speed Sensor System (Vehicle Speed)**



### ANGLE SENSOR

#### INSPECTION

##### 1. Neutral Resistance

Turn the ignition switch OFF.

Remove the angle sensor cover (page 21-27).

Disconnect the control motor 3P connector.

Measure and record the resistance between the Black/Red and Blue/Green connector terminal of the control motor side.

##### Neutral Resistance

Connection : Black/Red - Blue/Green

Standard : 4-6  $\Omega$

##### 2. Shift-up Resistance

Measure and record the resistance between the Blue/Green and Yellow/Red connector terminal of the control motor side while upshifting the gear manually using the gear change tool.

##### Shift-up Resistance

Connection : Blue/Green - Yellow/ Red

Measuring Condition : At Upshift

##### 3. Shift-down Resistance

Measure and record the resistance between the Blue/Green and Yellow/Red connector terminal of the control motor side while downshifting the gear manually using the gear change tool.

##### Shift-down Resistance

Connection : Blue/Green - Yellow/Red

Measuring Condition : At Downshift

##### 4. Calculated Result Comparison

Compare the above measurement to the result of the following calculations.

##### At Shift-Up :

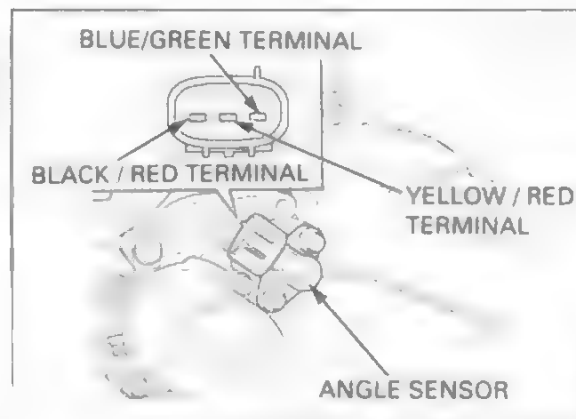
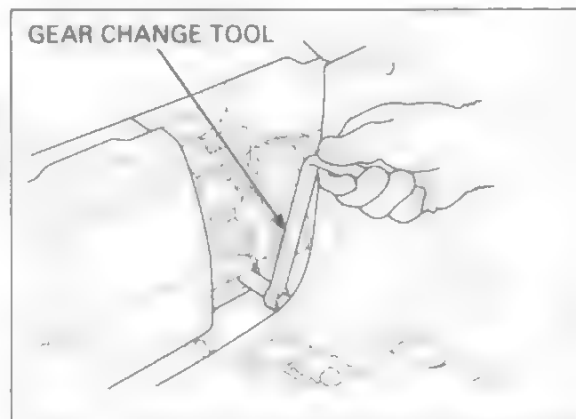
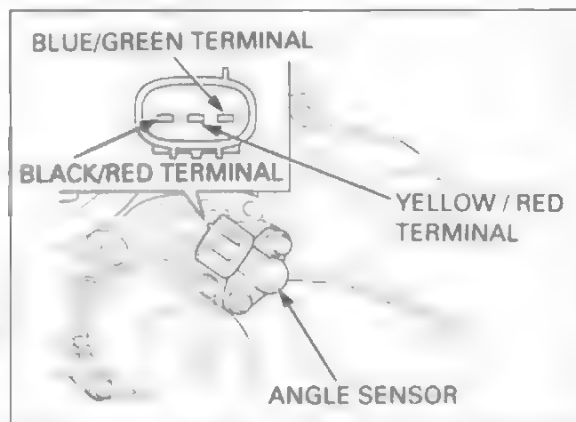
Measured shift-up resistance in step 2 / Neutral Resistance in step 1 < 0.4

The sensor is normal if the result of the calculation is less than 0.4.

##### At Shift-down :

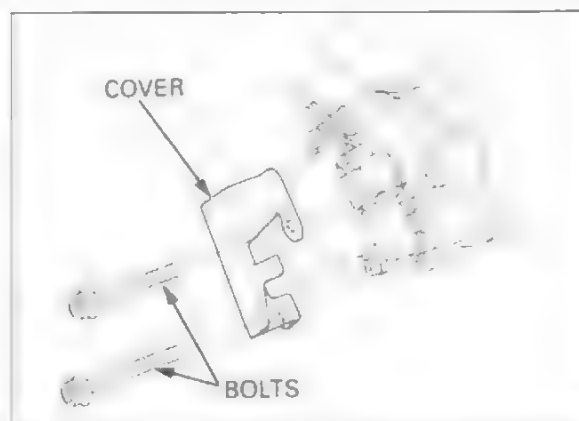
Measured shift-down resistance in step 2 / Neutral Resistance in step 1 > 0.6

The sensor is normal if the result of the calculation is greater than 0.6.



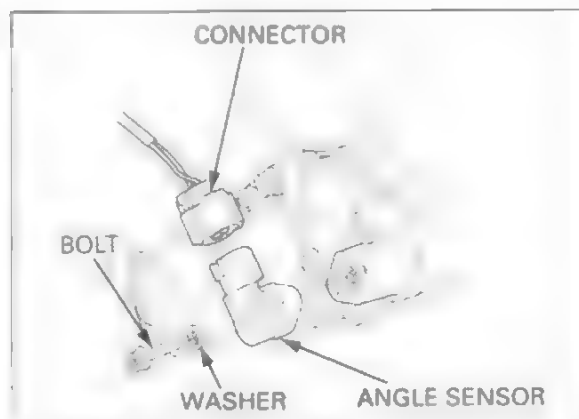
**REMOVAL**

Remove the the two bolts and cover.



Disconnect the angle sensor connector from the sensor.

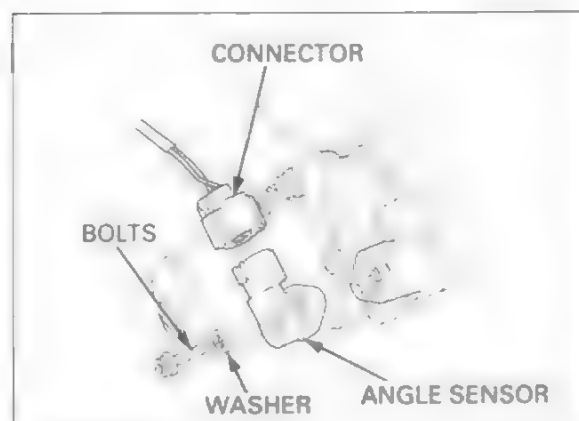
Remove the two bolts and angle sensor.

**INSTALLATION**

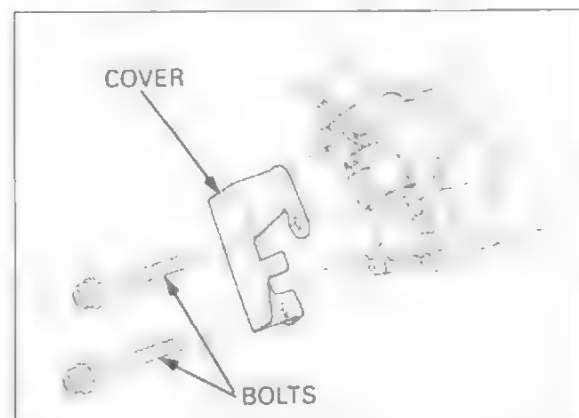
Instal the angle sensor aligning cutout with angle sensor shaft and gear shift spindle.

Tighten the two bolts and connect the angle senso.

**TORQUE : 6 N·m (0.6 kgf·m, 4.3lb·ft)**



Install the cover and tighten the two bolts.

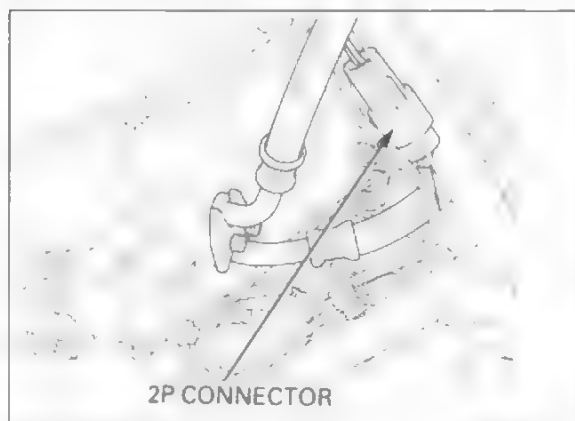


## CONTROL MOTOR

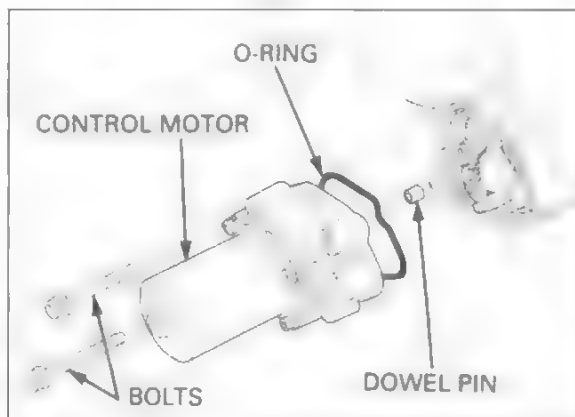
### REMOVAL

Remove the angle sensor (page 21-27).

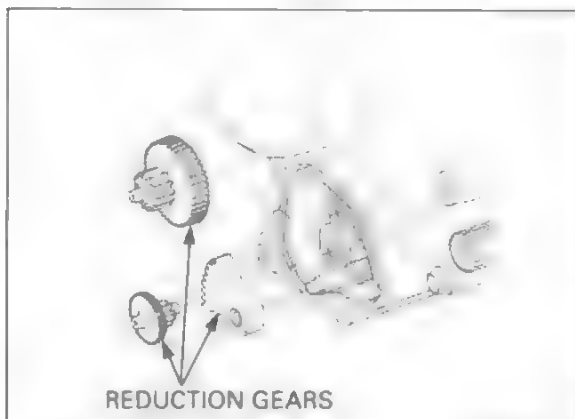
Disconnect the control motor 2P connector.



Remove the two bolts and control motor.  
Remove the O-ring and dowel pin.



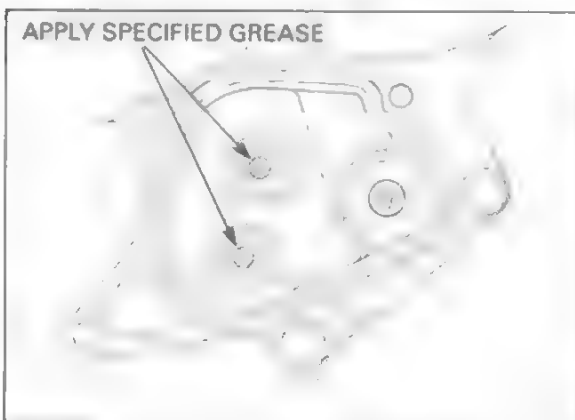
Disassemble the reduction gears.



### INSTALLATION

Thoroughly clean and apply the specified grease to the reduction gear shaft sliding surface as shown.

**RECOMMENDED GREASE :**  
**UNIREX N2 GREASE (ESSO) or**  
**UNIREX N3 GREASE (ESSO) or equivalent**

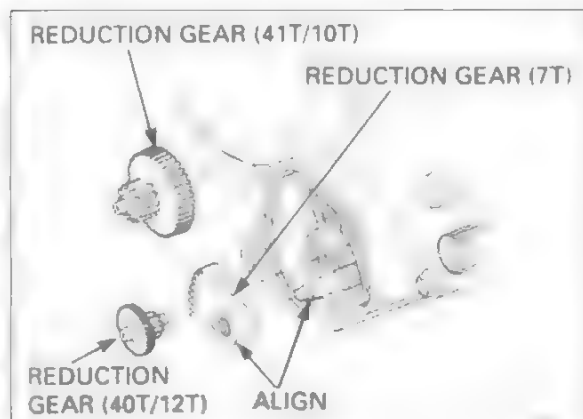


Thoroughly clean and apply the specified grease to the reduction gear contact area as shown.

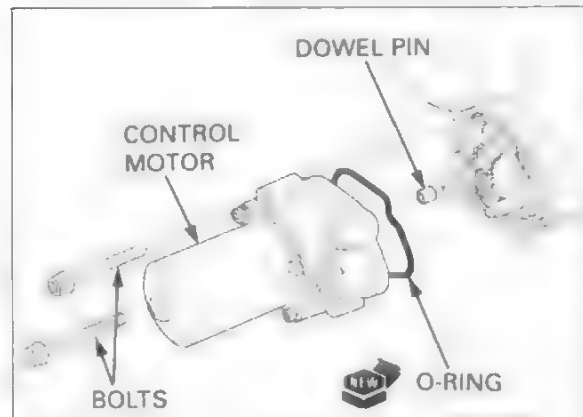
**RECOMMENDED GREASE :**  
**UNIREX N2 GREASE (ESSO) or**  
**UNIREX N3 GREASE (ESSO) or equivalent**



Install the reduction gears (41T/10T and 40T/12T).  
 Install the reduction gear (7T) by aligning the punch marks on the reduction gear (7T) and gear shift spindle.

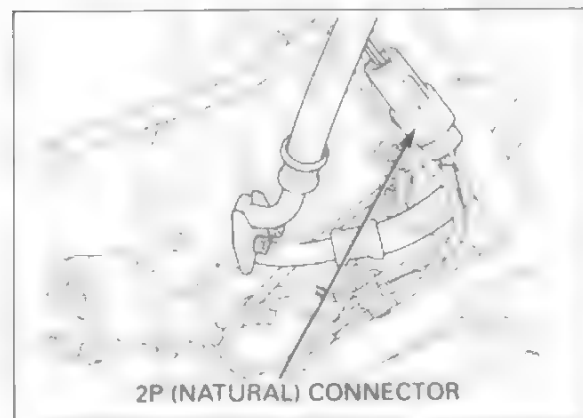


Install a new O-ring and dowel pin.  
 Install the control motor and tighten the bolts.



Connect the control motor 2P connector.

Install the angle sensor (page 21-27).



## GEAR POSITION SWITCH INSPECTION

Remove the right lower side cover (page 2-3).

Disconnect the gear position switch connector.

Check for continuity between the gear position switch 4P connector and body ground.

Continuity should exist between the color coded wire terminals as follows when in the appropriate gear.

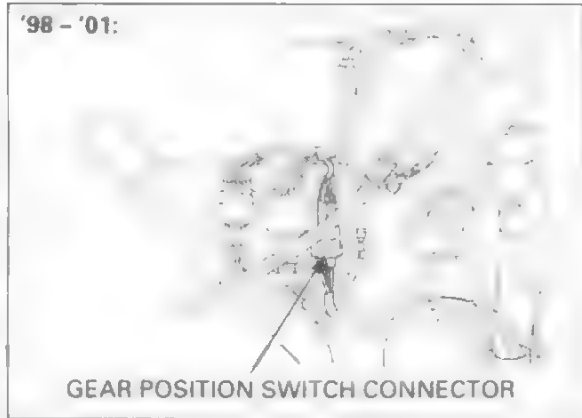
It is recommended to perform 16 tests to properly inspect the switch.

Make sure that the circuits with continuity and without continuity are OK. The same holds true for the After '01 switch. However, for this switch you need to perform 49 tests.

('98 - '01:)

	Gr	LG/R	W/G	LB	BODY GROUND
REVERSE	1	2	3	4	
NEUTRAL	5	6	7	8	
1ST	9	10	11	12	
5TH	13	14	15	16	

'98 - '01:



GEAR POSITION SWITCH CONNECTOR

After '01:



GEAR POSITION SWITCH CONNECTOR

(After '01:)

	Gr	Lg/R	W/G	P/Bu	Bu/W	Y/O	Lb/W	BODY GROUND
REVERSE	1	2	3	4	5	6	7	
NEUTRAL	8	9	10	11	12	13	14	
1ST	15	16	17	18	19	20	21	
2ND	22	23	24	25	26	27	28	
3RD	29	30	31	32	33	34	35	
4TH	36	37	38	39	40	41	42	
5TH	43	44	45	46	47	48	49	

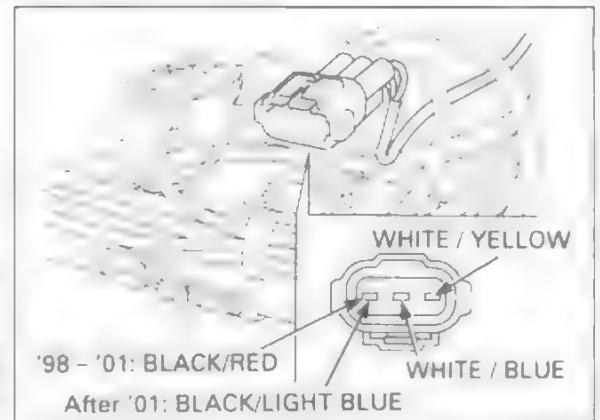
## SHIFT SWITCH INSPECTION

Remove the front fender (page 2-6).

Disconnect the shift switch connector.  
Check for the continuity between the shift switch 3P connector terminal of the switch side.

Continuity should exist between the color coded wire terminals as follows.

	W Bu	98 - '01 B P After '01 B Lb	W/Y	98 - '01 B R After '01 B Lb
UP				
FREE				
DOWN				

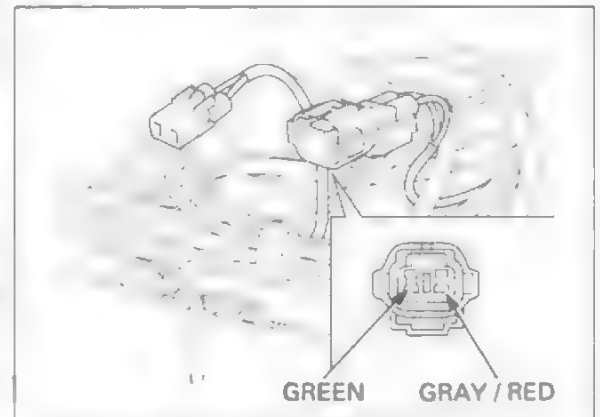


## REVERSE SHIFT SWITCH INSPECTION

Remove the front fender (page 2-6).

Disconnect the reverse shift switch 2P (red) connector.  
Check for the continuity at the reverse shift switch 2P (red) connector terminal of the switch side.

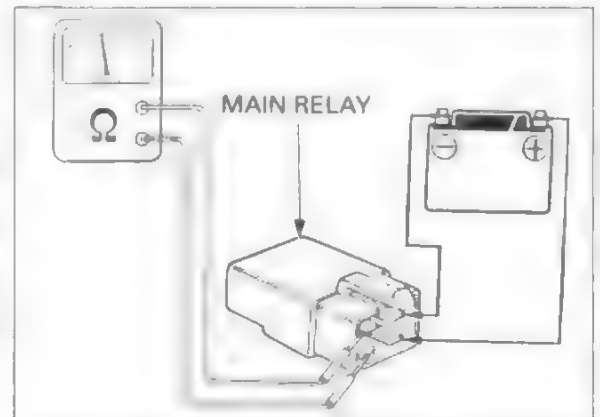
There should be continuity with the reverse selector operated and no continuity with it released.



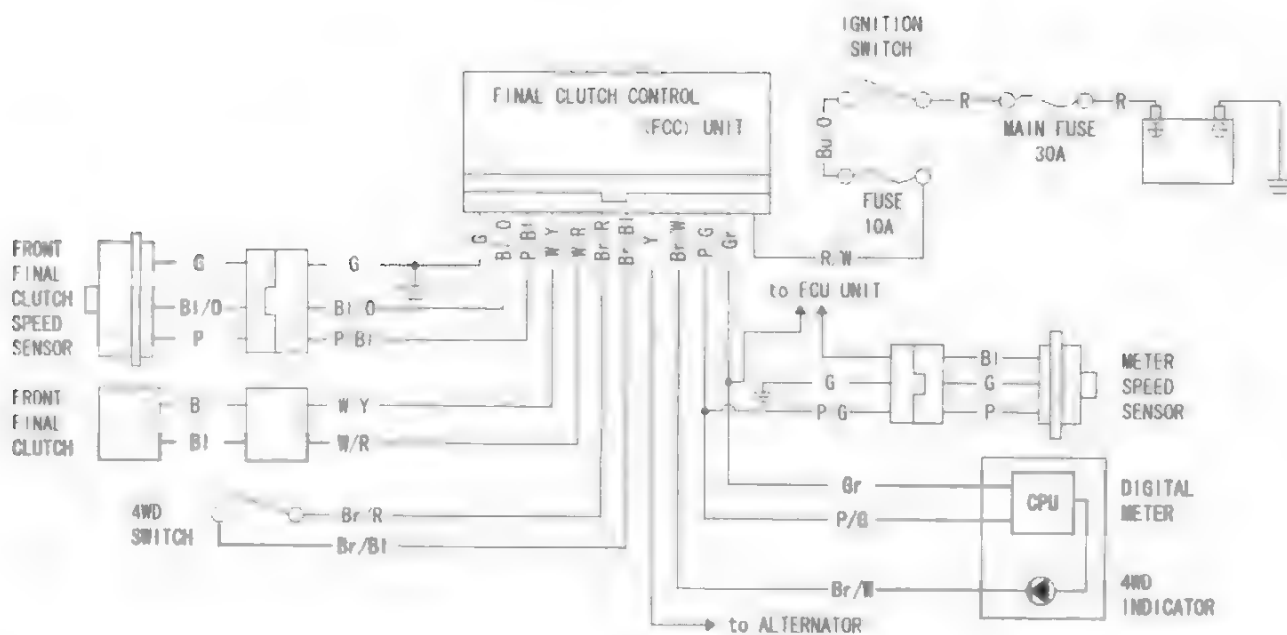
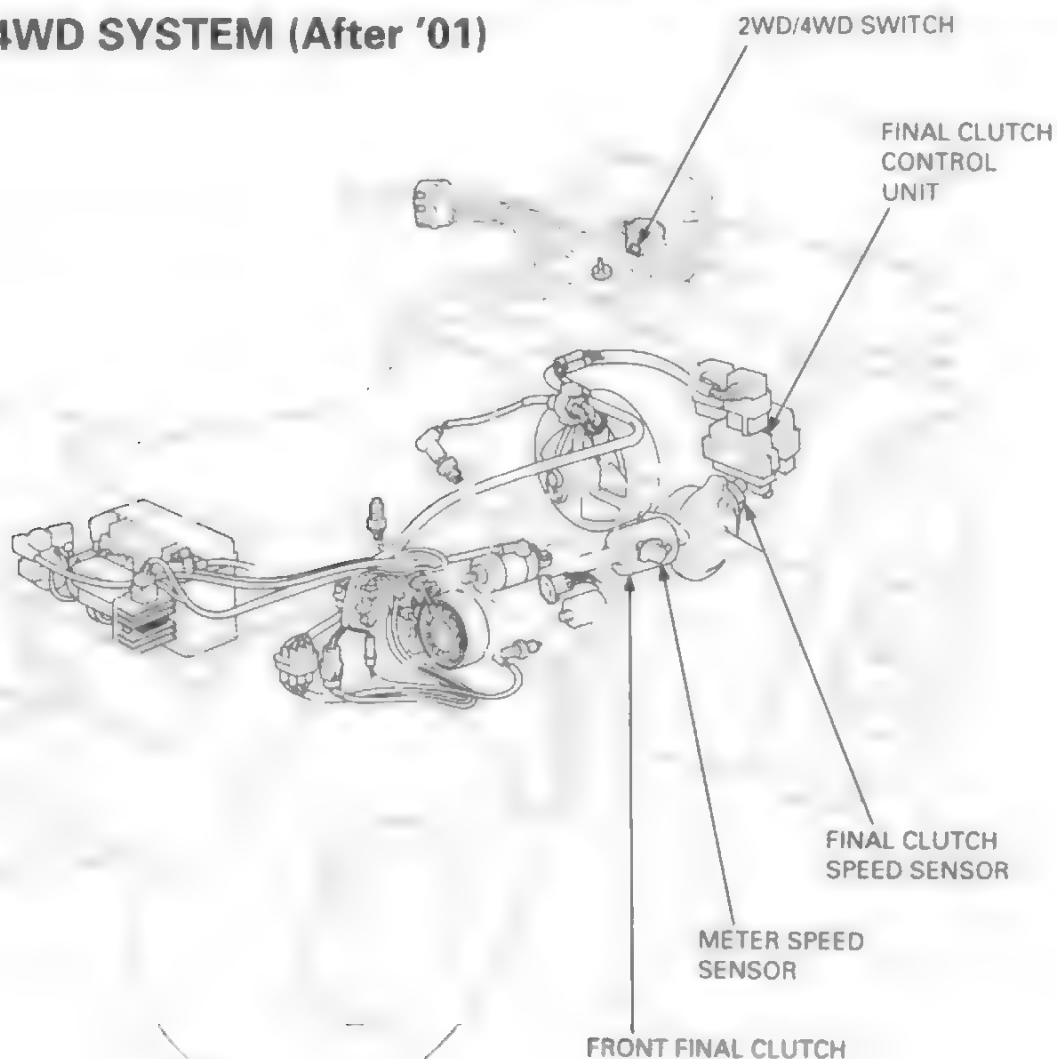
## MAIN RELAY ('98 - '01)

### CONTINUITY INSPECTION

Disconnect the connector from the main relay.  
Connect an ohmmeter to the Red/Yellow and Red/White terminals.  
Connect a fully charged 12V battery to the Black/Orange and Green wire terminals.  
There should be continuity while 12V battery is connected to the main relay connector terminals and there should be no continuity when the battery is disconnected.



# SELECTABLE 4WD SYSTEM (After '01)



## 22. SELECTABLE 4WD SYSTEM (After '01)

SYSTEM DIAGRAM	22-0	TROUBLESHOOTING	22-2
SERVICE INFORMATION	22-1		

### SERVICE INFORMATION

#### GENERAL

- For selectable 4WD system location, see page 22-0.
- When servicing the selectable 4WD system, always follow the steps in the troubleshooting flow chart (page 22-2).
- Front final clutch removal/installation, see section 15.
- The speed sensor digital pulse signal is sent to the control unit.
- Use a digital tester for selectable 4WD system inspection.

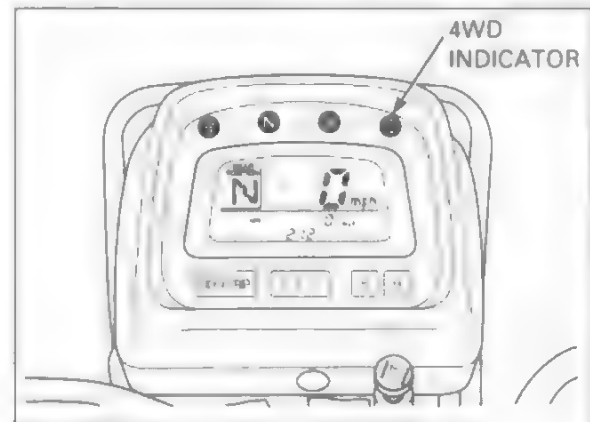


# TROUBLESHOOTING

## TROUBLESHOOTING FEATURE

The 4WD indicator (on the combination meter) denotes the problem codes by blinking two to six times. If the final clutch control (FCC) unit detects a problem, the current to the final clutch is cut-off. Then, the selectable 4WD system automatically engages the two rear drive wheels.

Turn the ignition switch from "OFF" to "ON" and the FCC unit will detect any problem codes in the selectable 4WD system. If there is still a problem, the indicator will blink a certain number of times to indicate the problem.



4WD indicator blinks	Check part and system	Probable faulty part	Refer to page
2	Front final clutch speed sensor	Front final clutch speed sensor or related wire harness or FCC unit	22-3
3	Meter speed sensor	Meter speed sensor or related wire harness or FCC unit	22-5
4	System voltage	Charging system or FCC unit	22-7
5	FCC unit driver	FCC unit	22-8
6	Alternator	Alternator or FCC unit or related wire harness	22-9

## 4WD Indicator Problem Code 2: Front Final Clutch Speed Sensor

- Inspect the following before diagnosing the system
  - tire size
  - tire air pressure

Check the connections of the FCC unit, front final clutch speed sensor and related circuit.

Abnormal →

- Loose or poor connections of related circuit

Normal

Turn the ignition switch "OFF".  
Disconnect the front final clutch speed sensor connector (3P/Gray).  
With the ignition switch "ON", measure the voltage between the Black/Orange and Green connector terminals of the wire harness side.

Out of range →

- Open circuit in Black/Orange wire
- Shorted Black/Orange wire



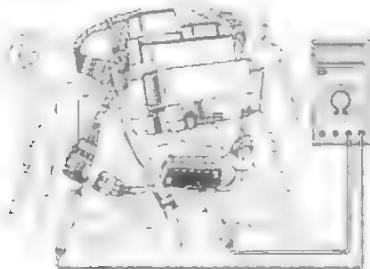
**CONNECTION:** Black/Orange (+) - Green (-)  
**STANDARD:** Battery voltage

Normal

Turn the ignition switch "OFF".  
Disconnect the final clutch control unit connector.  
Check for continuity between the Pink/Black terminals of the final clutch control unit connector and front final clutch speed sensor connector.

No continuity →

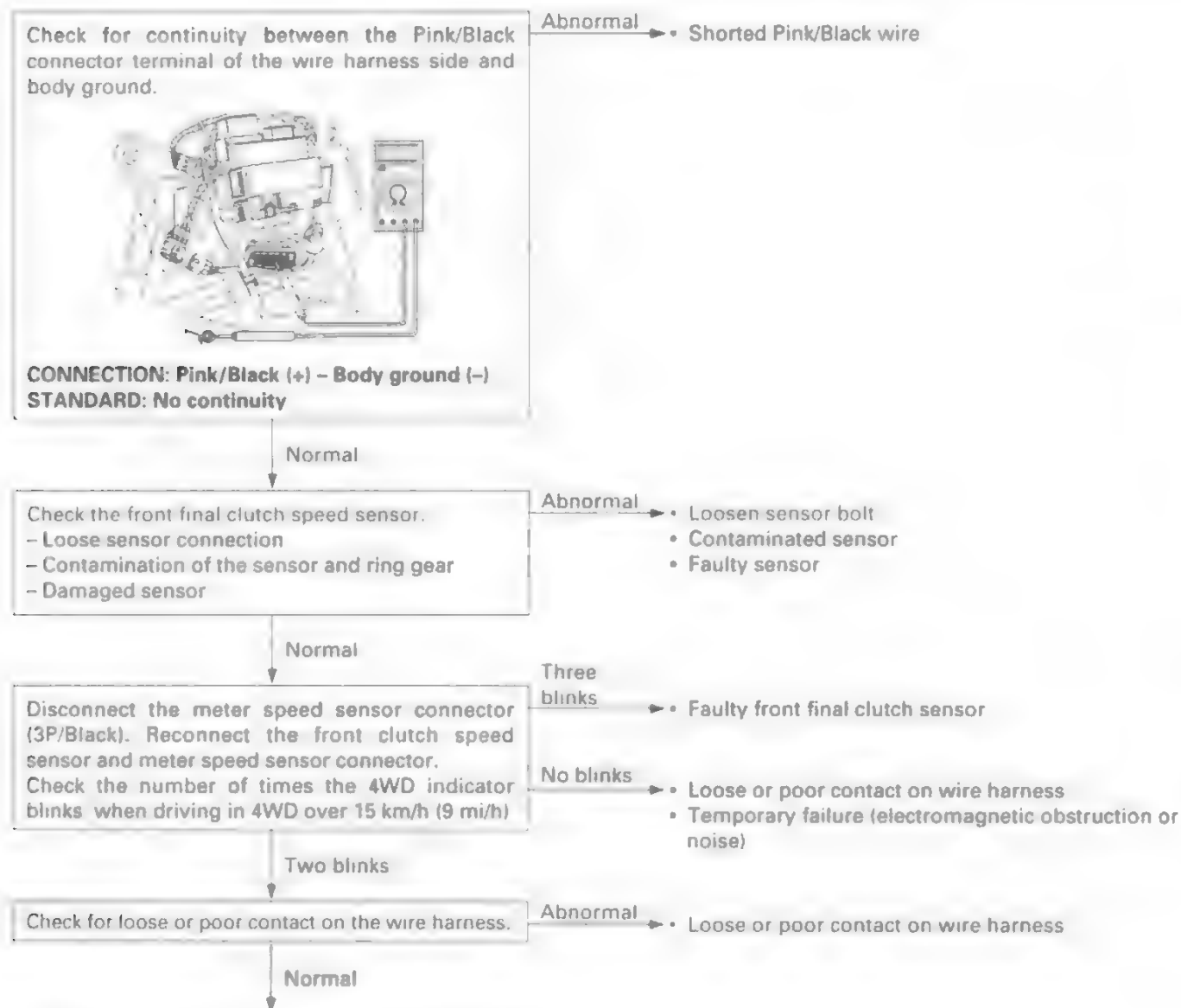
- Open circuit in Pink/Black wire



**CONNECTION:** Pink/Black (+) - Pink/Black (-)  
**STANDARD:** Continuity

Continuity

## SELECTABLE 4WD SYSTEM (After '01)



Replace the FCC unit with a new one and troubleshoot again.

**4WD Indicator Problem Code 3: Meter Speed Sensor**

- Inspect the following
  - tire size
  - tire air pressure

Check the connections of the FCC unit, meter speed sensor and related circuit.

Abnormal

- Loose or poor connections in related circuit

Normal

Turn the ignition switch "OFF".  
Disconnect the meter speed sensor connector (3P/Black).  
With the ignition switch "ON", measure the voltage between the Black/Blue and Green connector terminals of the wire harness side.

Out of range

- Open circuit in Black/Blue wire
- Shorted Black/Blue wire



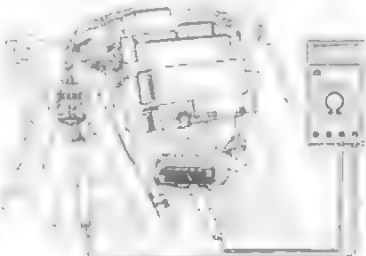
**CONNECTION:** Black/Blue (+) - Green (-)  
**STANDARD:** Battery voltage

Normal

Turn the ignition switch "OFF".  
Disconnect the final clutch control unit connector.  
Check for continuity between the Pink/Green terminals of the final clutch control unit connector and meter speed sensor connector.

No continuity

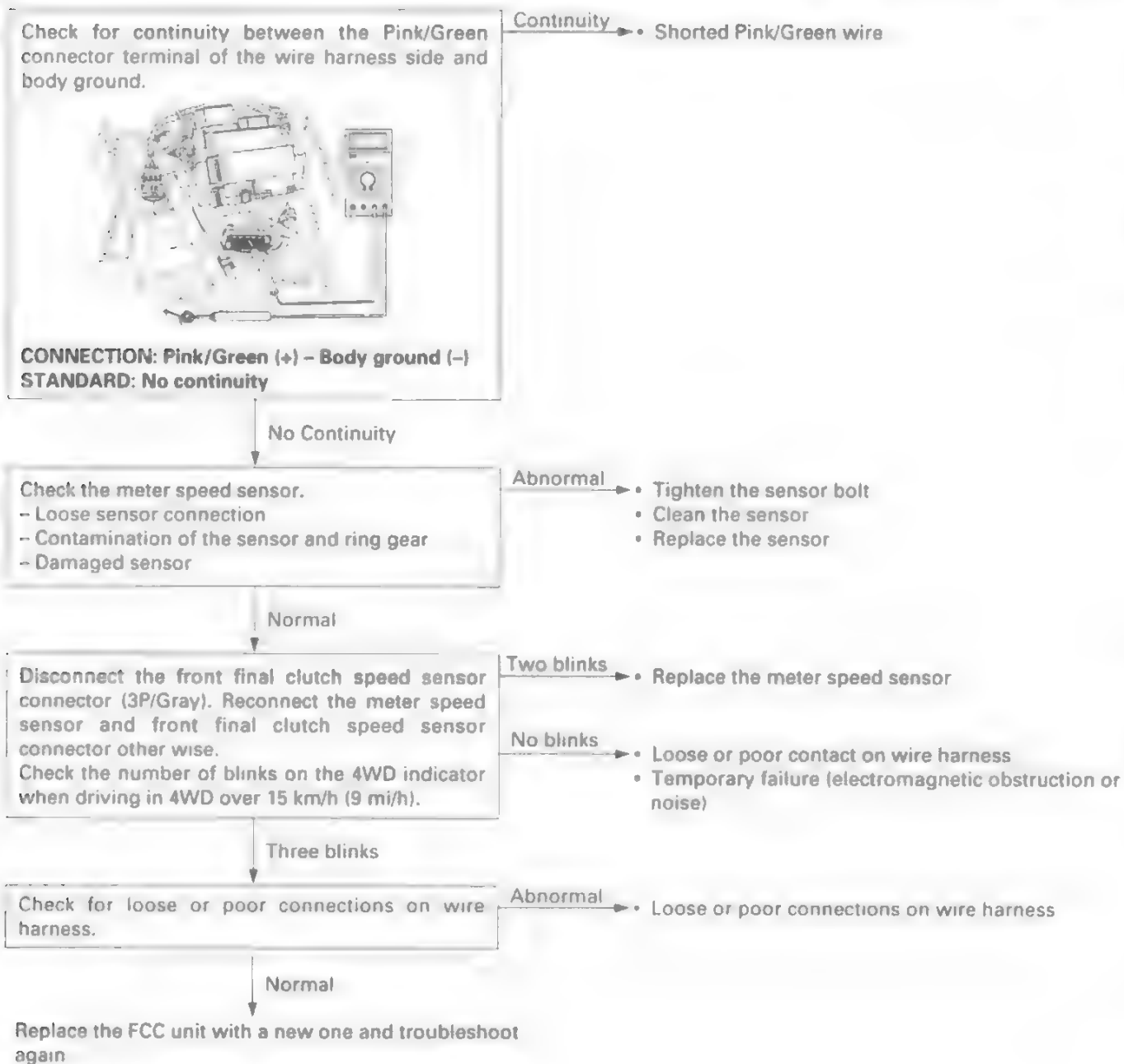
- Open circuit in Pink/Green wire



**CONNECTION:** Pink/Green (+) - Pink/Green (-)  
**STANDARD:** Continuity

Continuity

## SELECTABLE 4WD SYSTEM (After '01)



**4WD Indicator Problem Code 4: FCC Unit System Voltage**

- Inspect the following before diagnosing the system.
  - Make sure the battery is fully charged and in good condition.
  - Engine idle speed

Check the connections of the FCC unit, fuse box, battery and related circuit.

Abnormal

- Loose or poor connections in related circuit

Normal

Turn the ignition switch "ON" and check the number of times the 4WD indicator blinks after 30 seconds.

No blinks

- No problem (temporary failure)

four time blinks

Turn the ignition switch "OFF".  
Disconnect the FCC unit connector  
With the ignition switch "ON", measure the voltage between the Red/White and Green connector terminals of the wire harness side.

Abnormal

- Short or open circuit between battery and FCC unit
- If the related wire is OK, check the charging system (section 17)



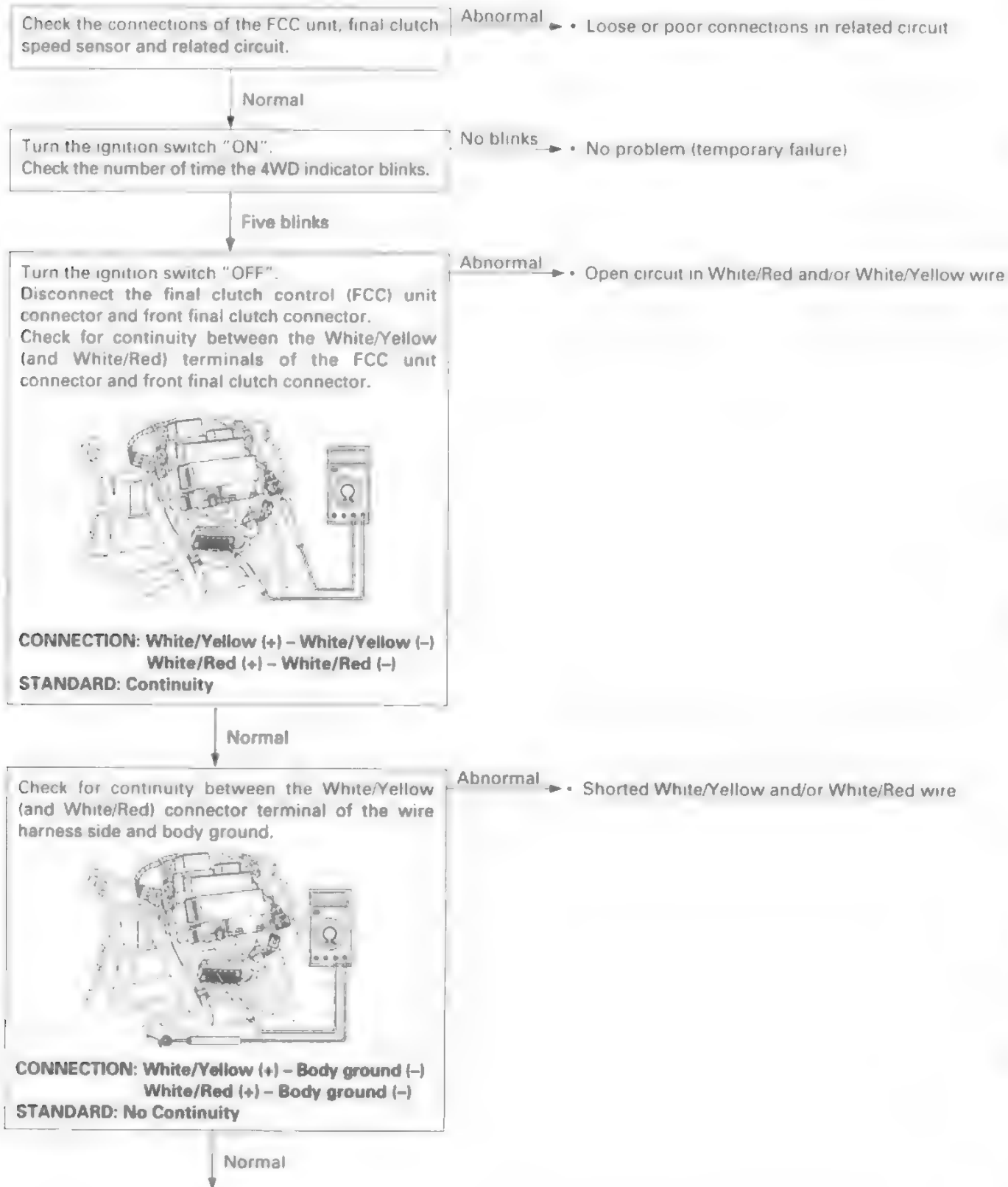
CONNECTION: Red/White (+) – Green (–)  
STANDARD: 11 – 16 V

Normal

Replace the FCC unit with a new one and troubleshoot again

## SELECTABLE 4WD SYSTEM (After '01)

### 4WD Indication Problem Code 5: FCC Unit Driver



Measure the resistance between the White/Red and White/Yellow terminals of the front final clutch.

**CONNECTION:** White/Yellow (+) – White/Red (–)

**STANDARD:** 3 – 7  $\Omega$

Abnormal

• Faulty front final clutch

Normal

• Replace the FCC unit with a new one and troubleshoot again

## 4WD Indicator Problem Code 6: Alternator

Check the connections of the FCC unit, alternator and related circuit.

Abnormal

• Loose or poor contact of related circuit

Normal

Check the number of 4WD indicator blinks when driving in 4WD over 10 km/h (6 mi/h) for more than 30 seconds.

No blinks

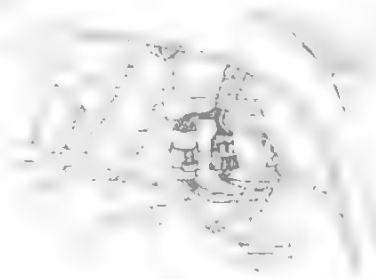
• No problem (temporary failure)

Six blinks

Turn the ignition switch "OFF".  
Disconnect the final clutch control (FCC) unit connector and alternator connector.  
Check for continuity between the Yellow terminals of the FCC unit connector and alternator connector.

Abnormal

• Open circuit in Yellow wire



**CONNECTION:** Yellow (+) – Yellow (–)

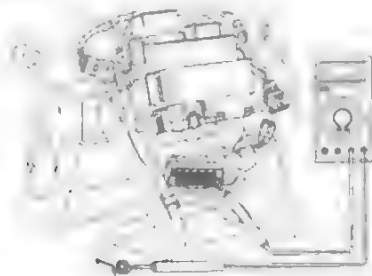
**STANDARD:** Continuity

Normal



## SELECTABLE 4WD SYSTEM (After '01)

Check for continuity between the Yellow connector terminal of the wire harness side and body ground.



**CONNECTION: Yellow (+) – Body ground (–)**  
**STANDARD: No Continuity**

**Abnormal** → • Shorted Yellow wire

**Normal**

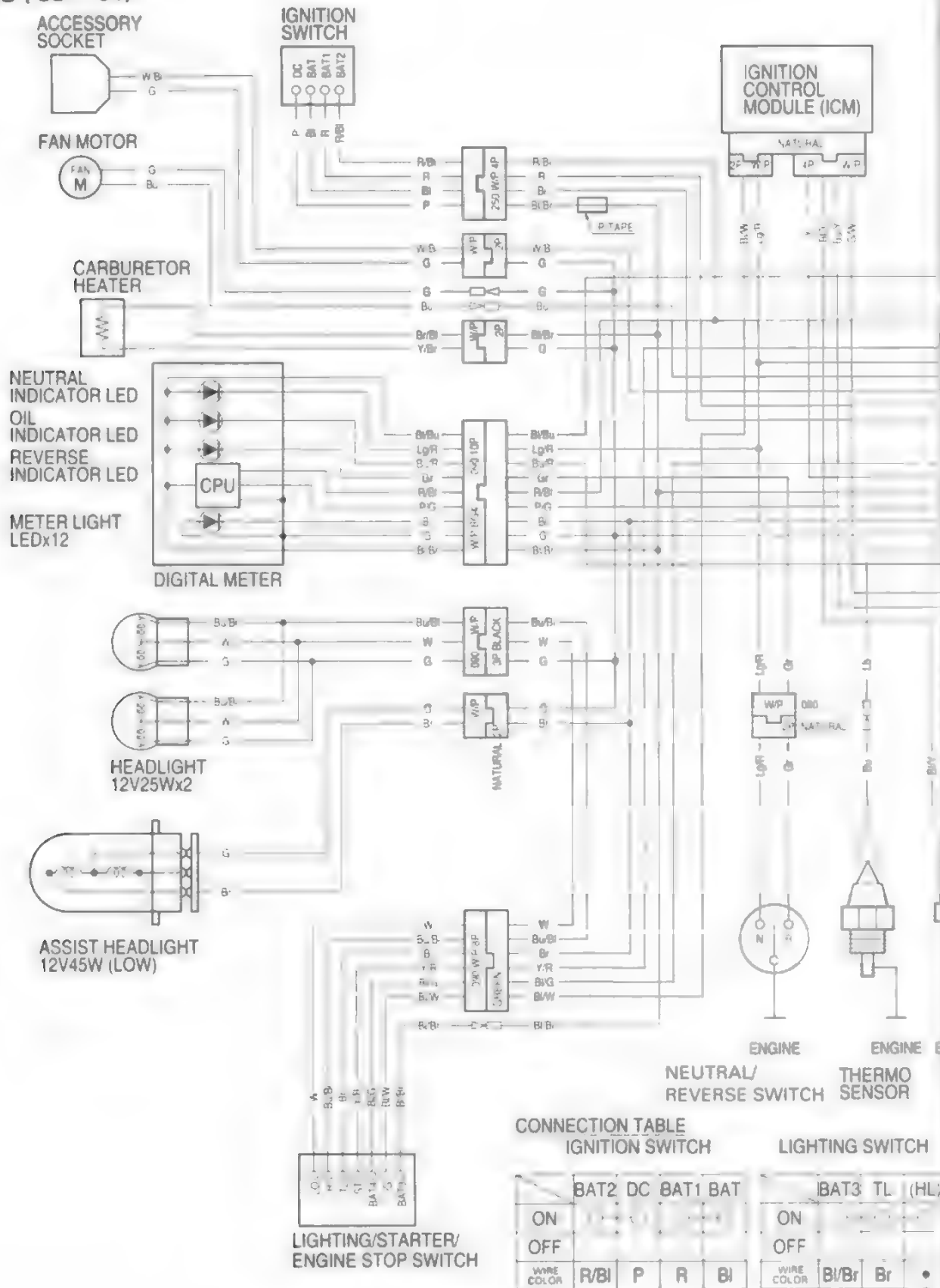
Check the battery/charging system (section 17)

**Abnormal** → • Faulty battery/charging system

**Normal**

→ • Replace the FCC unit with a new one and troubleshoot again

# TRX450S ('98 - '01)



CONNECTION TABLE				CONNECTION TABLE			
IGNITION SWITCH				LIGHTING SWITCH			
	BAT2	DC	BAT1	BAT		BAT3	TL (HL)
ON					ON		
OFF					OFF		
WIRE COLOR	R/BI	P	R	BI	WIRE COLOR	BI/Br	Br

**SPEED SENSOR**

**REGULATOR/RECTIFIER**

**STARTER MOTOR** (M)

**ENGINE**

**BATTERY 12V12AH**

**MAIN FUSE 30A**

**ENGINE**

**FUSE BOX**

**TAILLIGHT (12V5Wx2)**

**ENGINE**

**FRAME**

**IGNITION COIL**

**SPARK PLUG**

**ENGINE**

**ENGINE**

**IGNITION PULSE GENERATOR**

**ALTERNATOR**

**FAN CONTROL UNIT**

**COLOR CODE**

Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

**COLOR CODE GROUND/MARKING**

**DIMMER SWITCH**

(HI)	LO	HI
LO	(N)	HI
WIRE COLOR	W	Bu/Bl

**ENGINE STOP SWITCH**

BAT4	IG
OFF	
RUN	
OFF	
WIRE COLOR	B/G BI/W

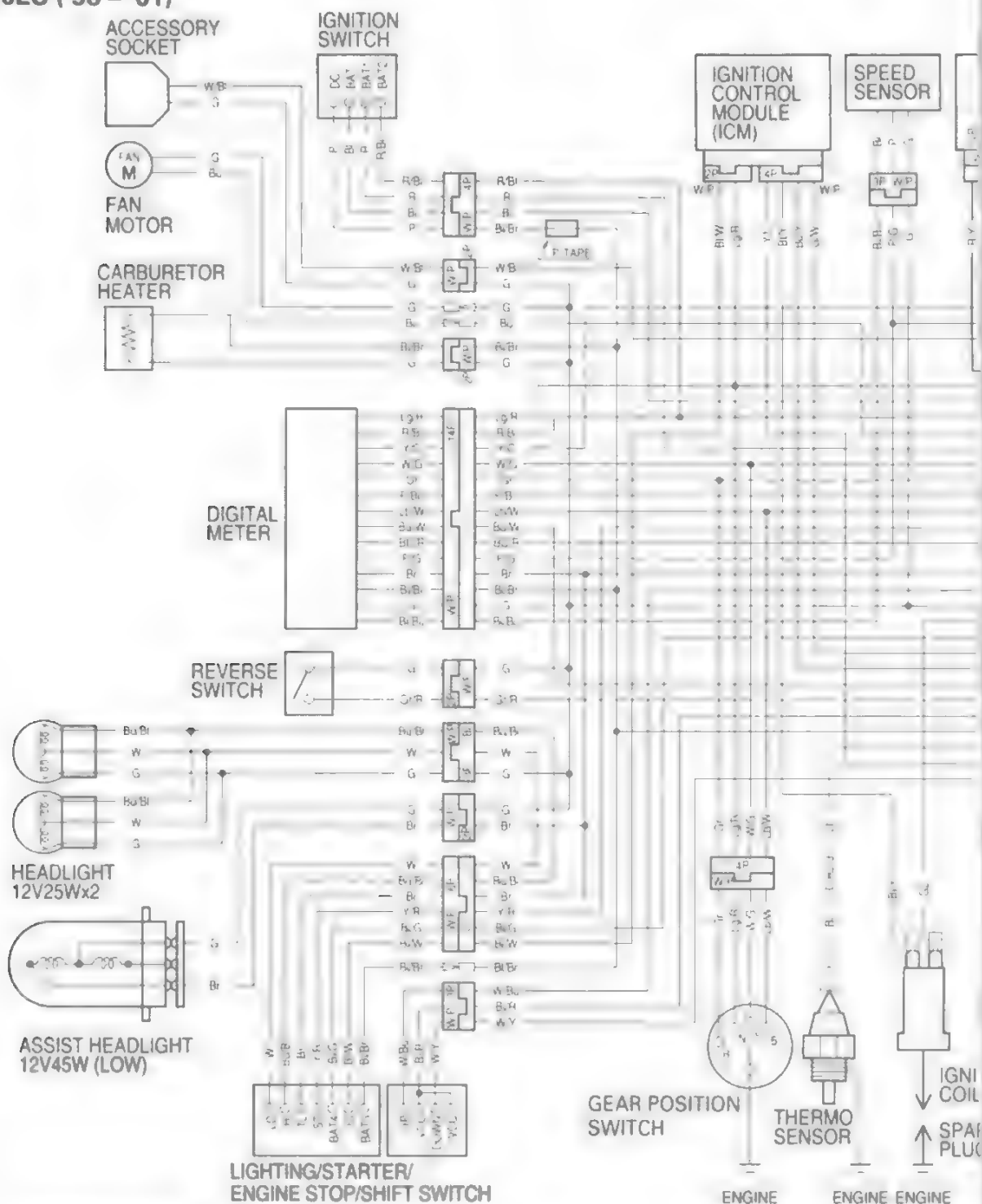
**STARTER SWITCH**

BAT3	ST
FREE	
PUSH	
WIRE COLOR	Bl/Br Y/R

**0030Z-HN0-A000**

# WIRING DIAGRAM

TRX450ES ('98 - '01)



CONNECTION TABLE  
IGNITION SWITCH

	BAT2	DC	BAT1	BAT
ON				
OFF				
WIRE COLOR	R/BI	P	R	BI

LIGHTING SWITCH

	BAT3	TL	(HL)
ON			
OFF			
WIRE COLOR	BI/Br	Br	

DIMMER SWITCH

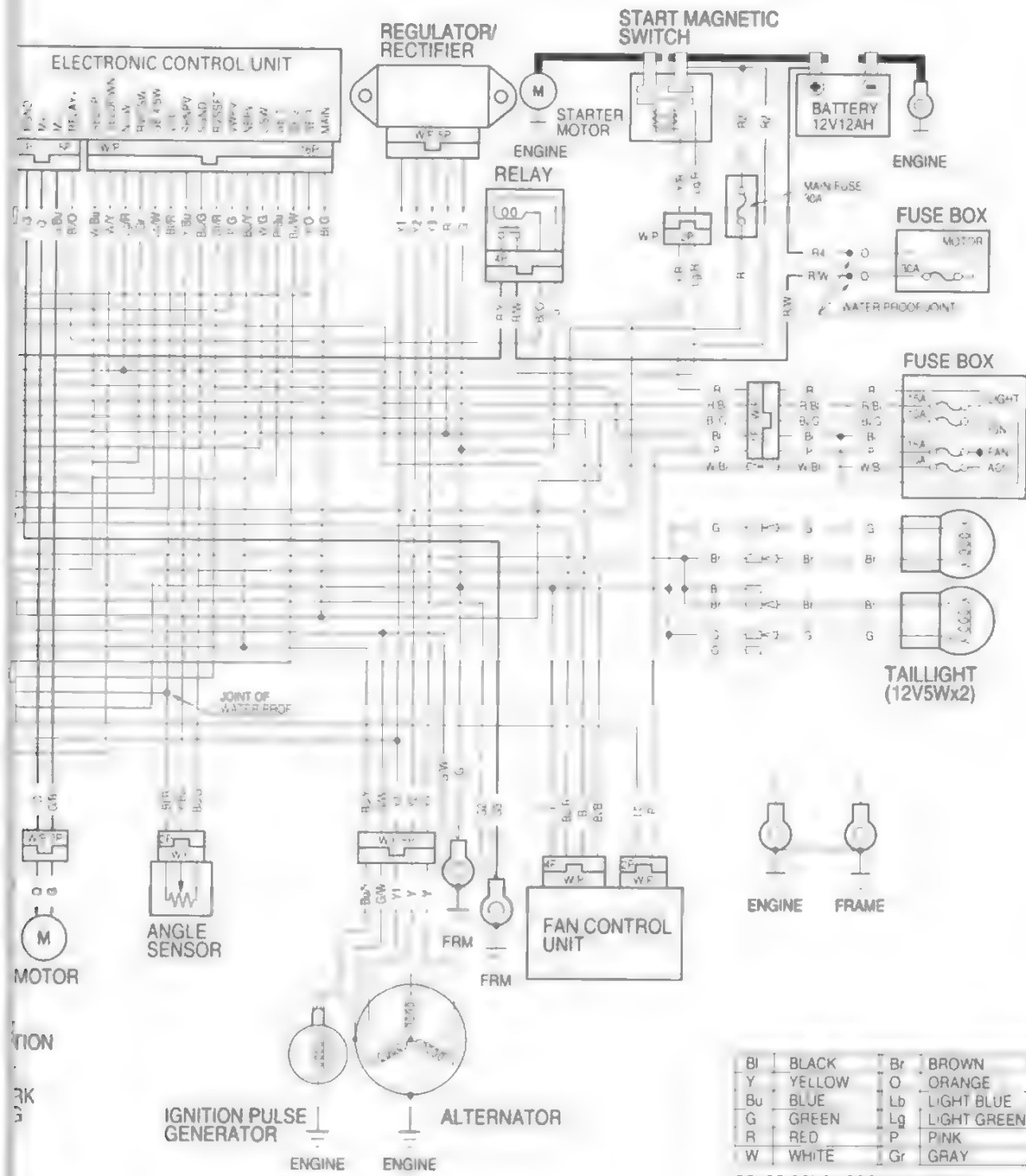
	(HI)	LO	HI
LO			
(N)			
HI			
WIRE COLOR		W	Bu/BI

ENGINE STOP SWITCH

	BAT4	IG
OFF		
RUN		
OFF		
WIRE COLOR	BL/G	BI/W

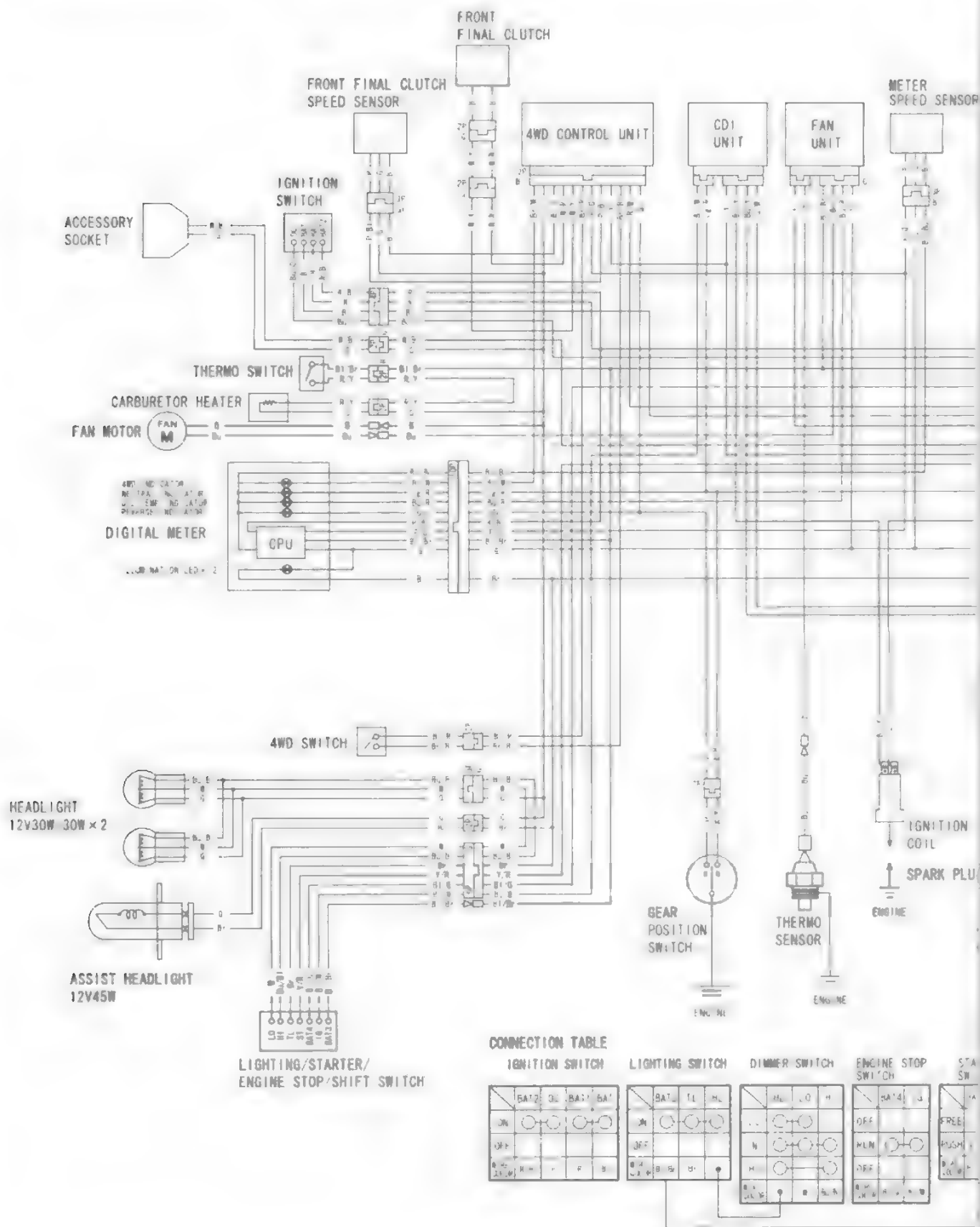
STARTER SWITCH

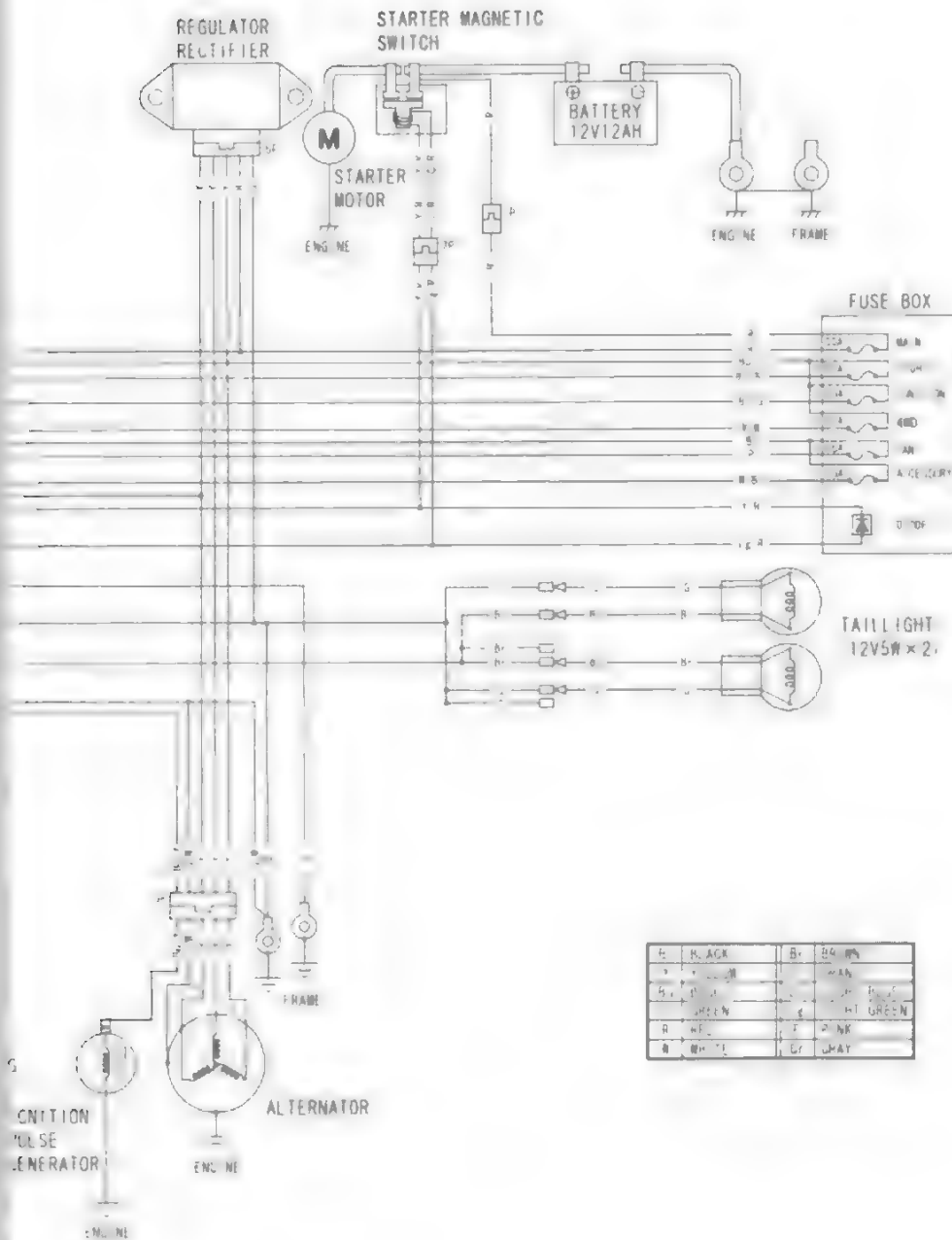
	FREE
FREE	
PUSH	
WIRE COLOR	



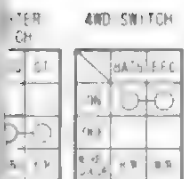
0030Z-HN0-A100

# TRX450FM (After '01)





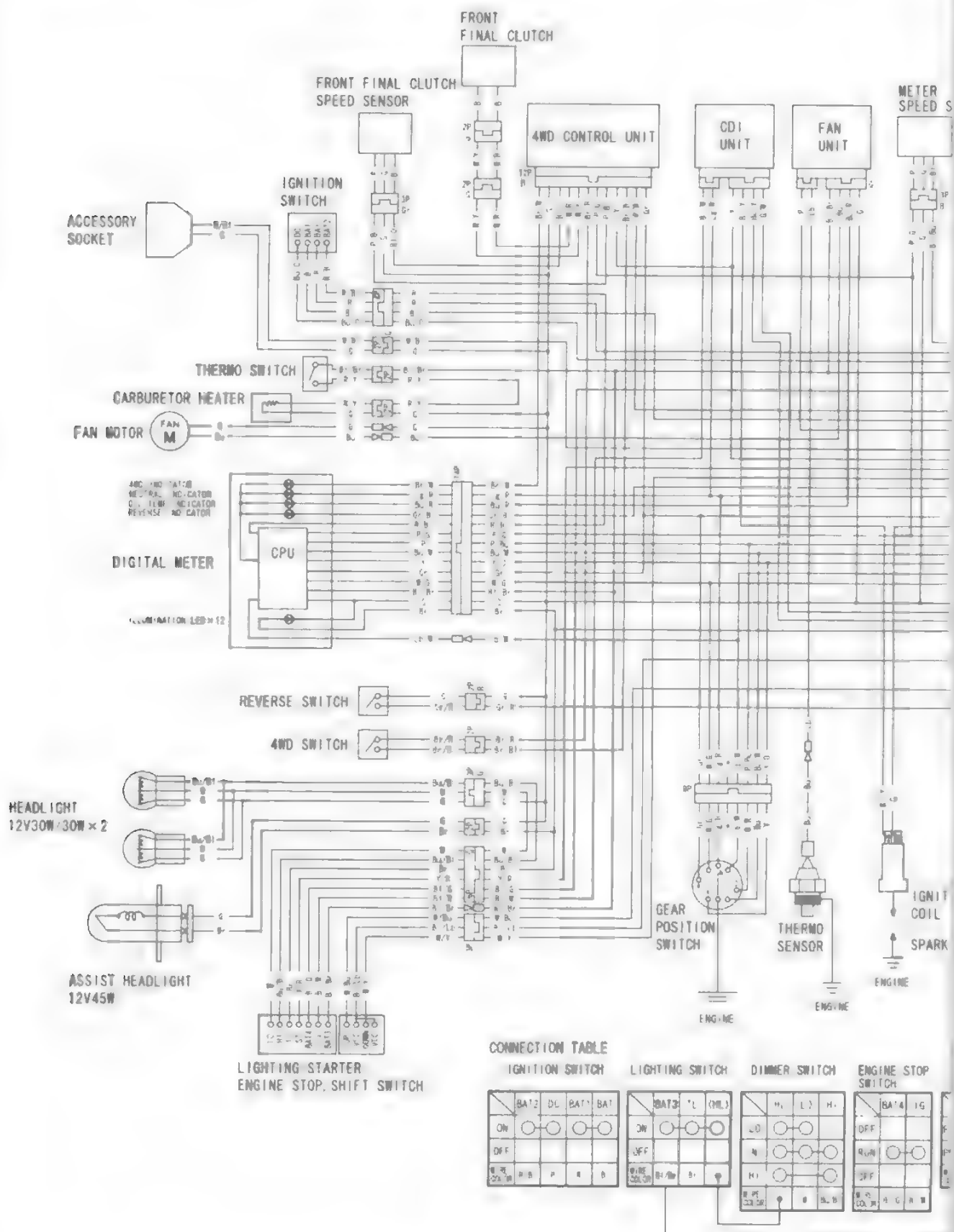
12	BLACK	B+	B+ BATT
13	RED	B-	B- BATT
14	GREEN	S	HT GREEN
15	WHITE	F	WHITE
16	GRAY	Gr	GRAY



0030Z - HNO - 6700

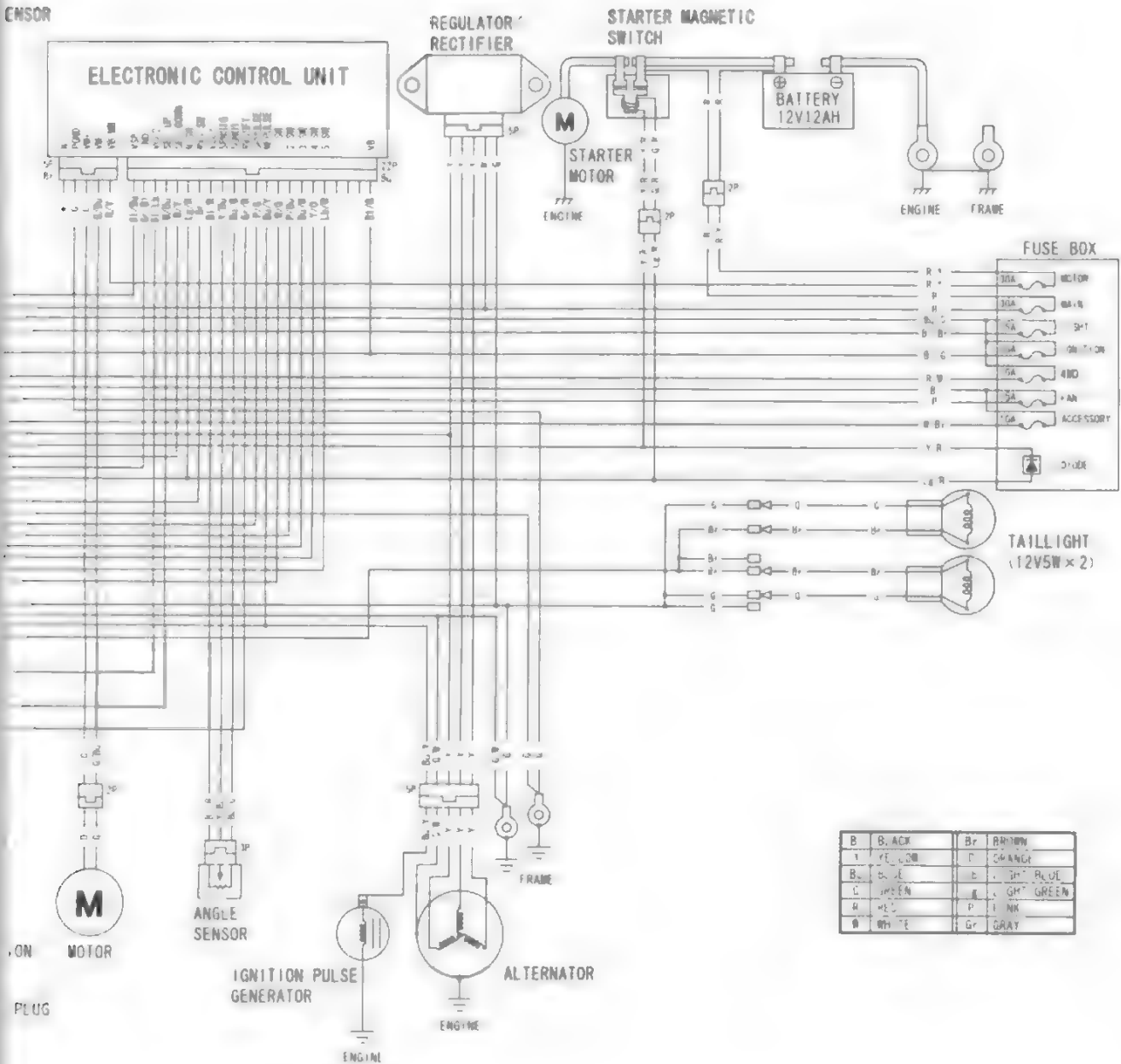
# WIRING DIAGRAM

TRX450FE (After '01)

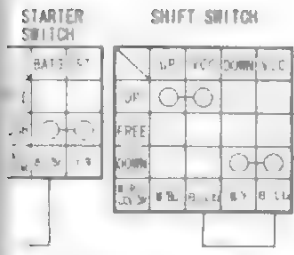




SENSOR



B	BLACK	Br	BROWN
Y	YELLOW	C	CHANGA
Bu	BLUE	Gr	GRAY
W	WHITE	P	PINK
Gr	GREEN	R	RED
Bl	BLU	Sh	SH-1
Ln	LN	Un	UN
Ln	LN	Un	UN



0030Z - HNO - 7700

# 24. TECHNICAL FEATURES

ELECTRIC SHIFT PROGRAM (ESP) 24-1

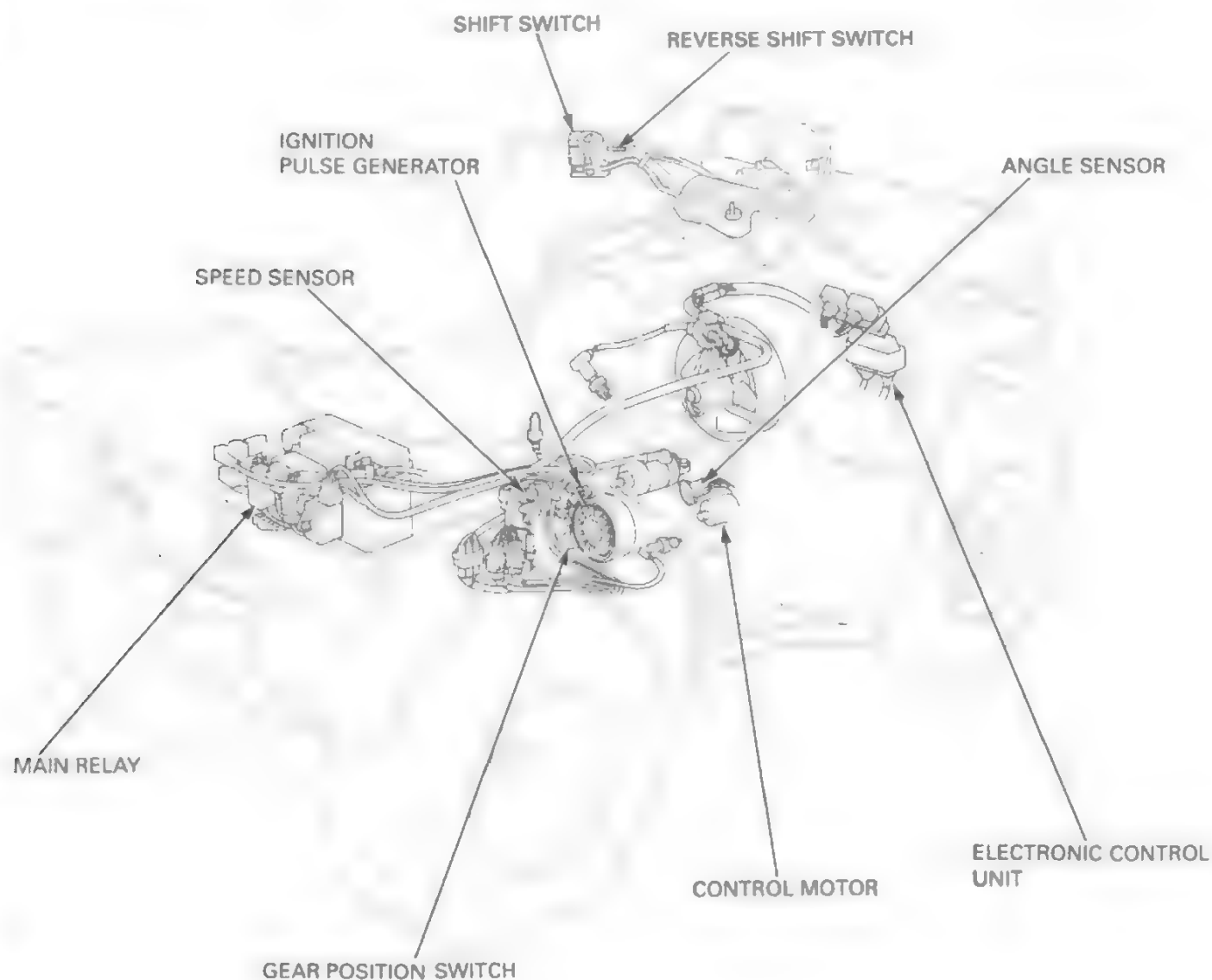
SELECTABLE 4WD SYSTEM  
(After '01)

24-5

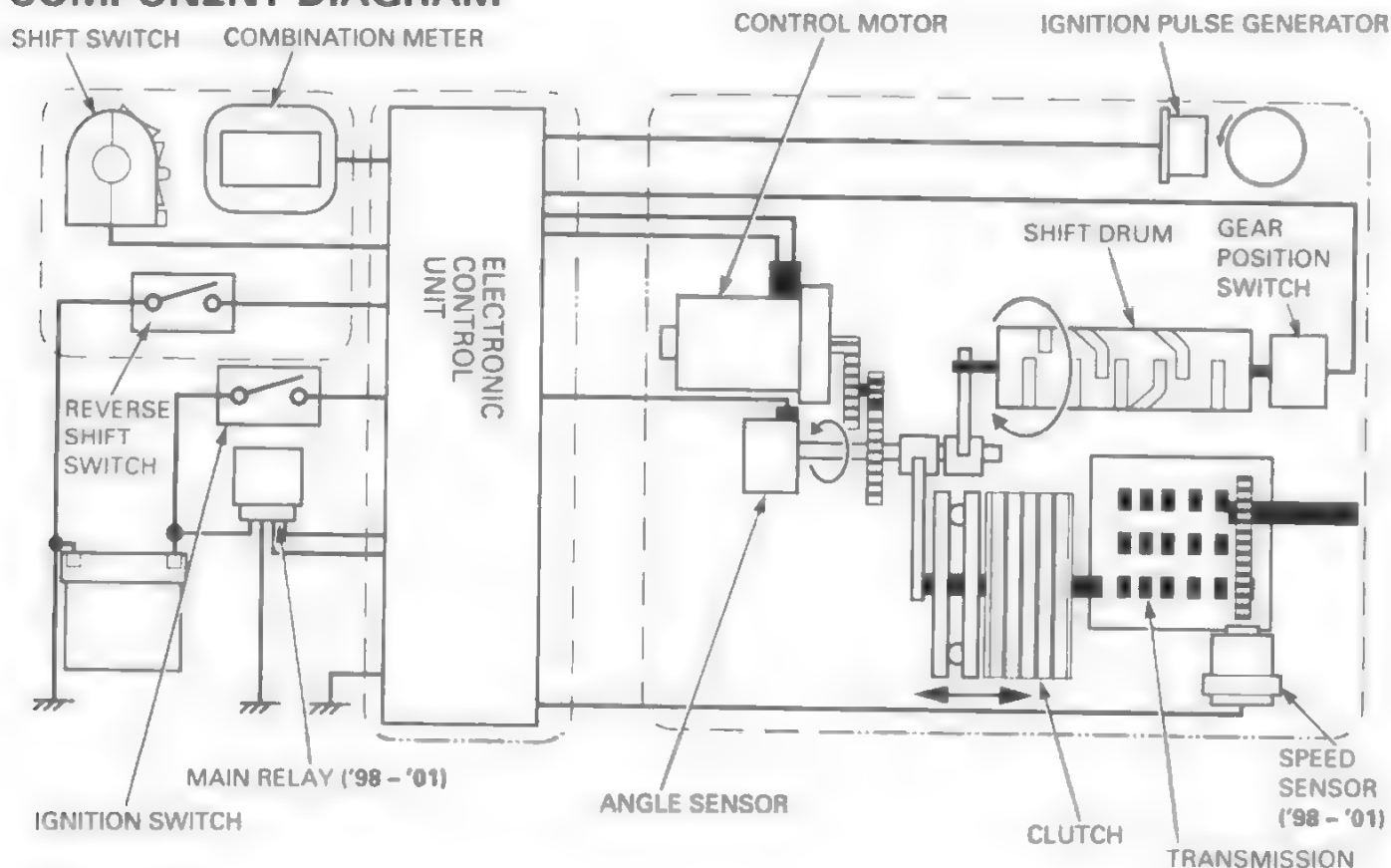
## ELECTRIC SHIFT PROGRAM (ESP)

The electric shift program (ESP) is designed to make gear shift operation easier by replacing the foot-operated shift pedal with a switch located near the operator's left hand.

'98 - '01 SHOWN:



## COMPONENT DIAGRAM



### Shift Position Indicator

The shift position indicator incorporated in the combination meter indicates the gear position, detected through the gear position switch (operated by an electric on and off switch to detect reverse, neutral, 1st, and 5th gears) and ECU signals (calculated from the signals from both the engine speed and vehicle speed to detect 2nd, 3rd, 4th gears).

After '01, all gears are detected through the gear position switch.

### Shift Switch

When the operator pressing the shift switch that is installed on the left handlebar, it sends a corresponding shift-up or shift-down signal to the ECU.

### Reverse Shift Switch

The reverse shift switch that is located above the rear brake lever bracket, turns on when the reverse selector is operated.

### Main Relay ('98 - '01)

The main relay that is located inside the rear fender, shuts off the electric current for the control motor when the ECU detects an error.

### Electronic Control Unit (ECU)

The ECU that is located under the front fender, controls the system by processing the signals coming from each switch and sensor. It also operates the control motor.

### Ignition Pulse Generator

The pulse generator that is located on the rear crankcase cover, controls the ignition system and also sends an engine speed signal to the ECU.

### Control Motor

The control motor is located on the front crankcase cover, and rotates the sub-gearshift spindle depending on the voltage from the ECU.

## Angle Sensor

The angle sensor that is located on the control motor, converts the direction of rotation, rotating angle and rotating speed of the sub-gearshift spindle into voltage and speed signals, and outputs them to the ECU.

## Gear Position Switch

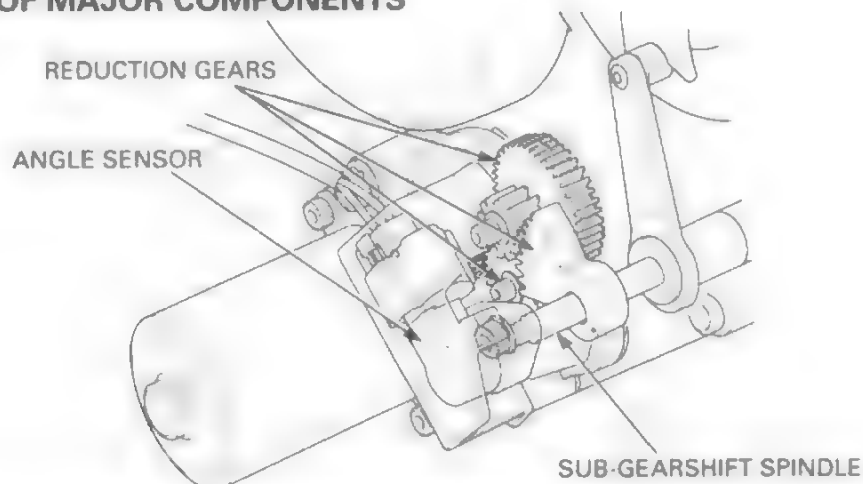
The gear position switch that is located inside the rear crankcase, controls the starter relay switch and also sends gear signals (For '98 - '01: reverse, neutral 1st, and 5th - After '01: all gears) to the ECU.

## Speed Sensor

The speed sensor that is located on the rear crankcase, sends a vehicle speed signal to both the combination meter and the ECU.

## DESCRIPTION OF MAJOR COMPONENTS

### Angle Sensor

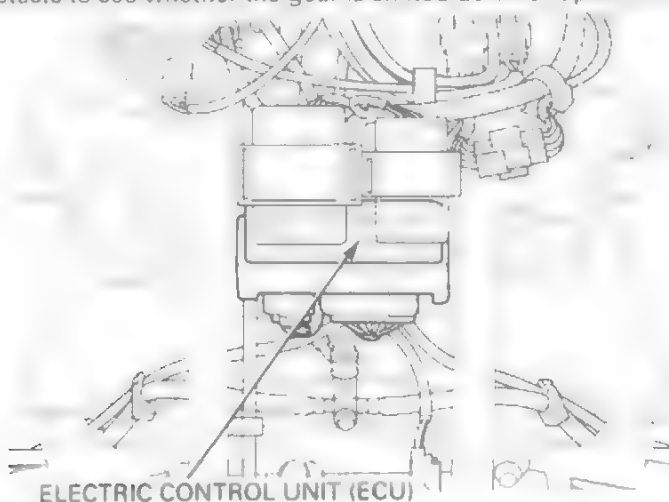


The angle sensor shaft is connected to the end of the sub-gearshift spindle. It converts the direction of rotation, rotating angle and rotating speed of the sub gearshift spindle, into voltage and speed signals and then outputs these signals to the ECU.

The rotation of the angle sensor shaft changes a variable resistance value, thereby changing the out-put voltage to the Electronic Control Unit from the angle sensor.

The Electronic Control Unit detects to see whether the gear is shifted down or up from the voltage change.

### Electronic Control Unit

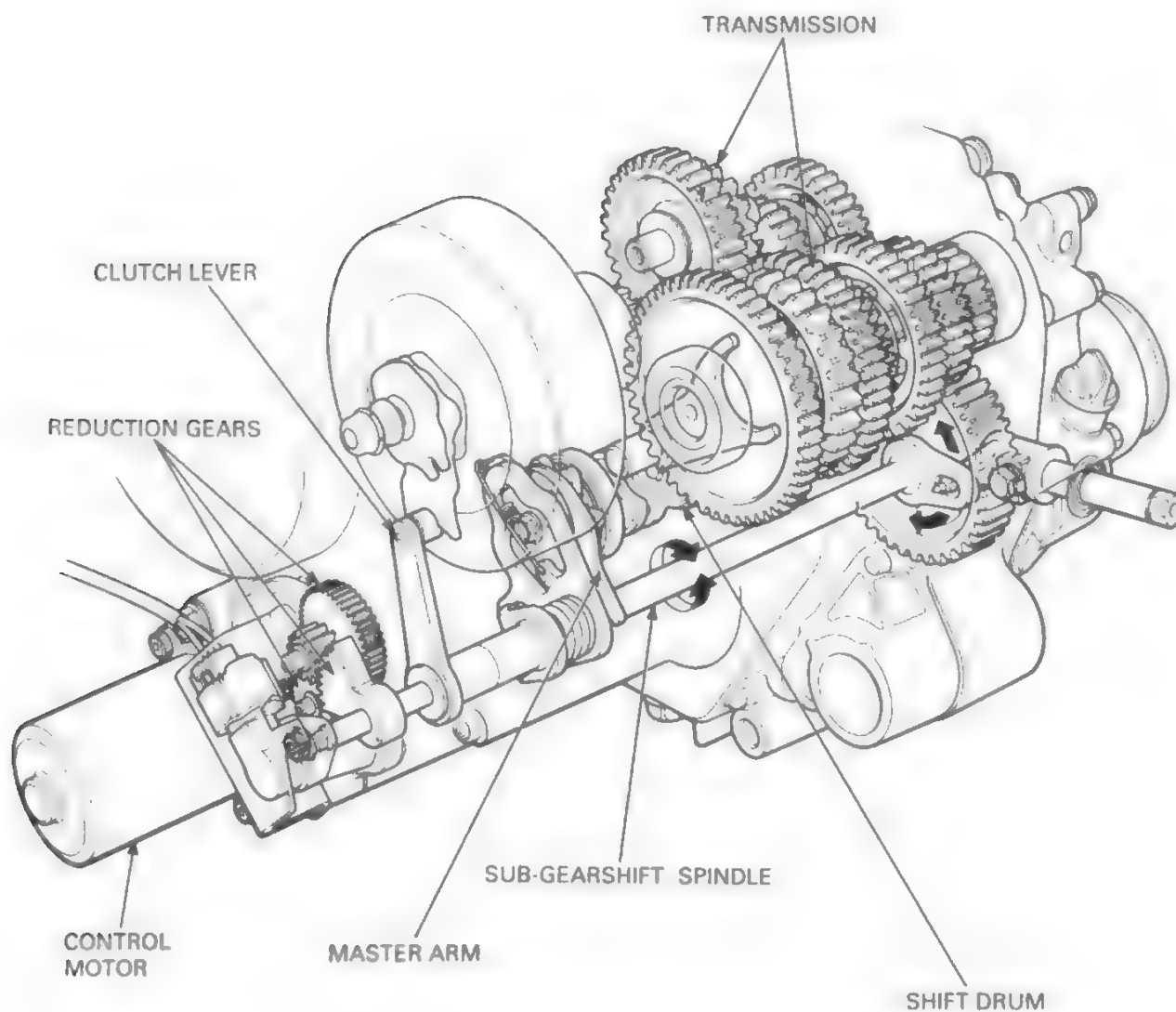


Consisting of the CPU, a motor drive circuit and gear position (2nd, 3rd and 4th gear signals) output circuits, the Electronic Control Unit calculates the signals from each switch and sensor and controls the ESP system.

The Electronic Control Unit has a self-diagnostic function (though it does not have the capability to display the results) which checks the whole system.

If any error is found as the result of self-diagnosis, it shuts off the electric current to the main relay ('98 - '01), stopping the ESP.

If the error is temporary, turn the ignition switch to "OFF" to erase the self-diagnostic results. Then, restart the engine to resume the system.



The shift control motor activates the clutch and shaft changes. It rotates the clutch lever, master arm and shift drum via the reduction gear and sub-gearshift spindle. It activates the clutch and shift changes. The shape and number of the transmission gear dogs have been changed to cope with faster speed of gear shifting by a shift control motor in place of the conventional foot-operated shift mechanism.

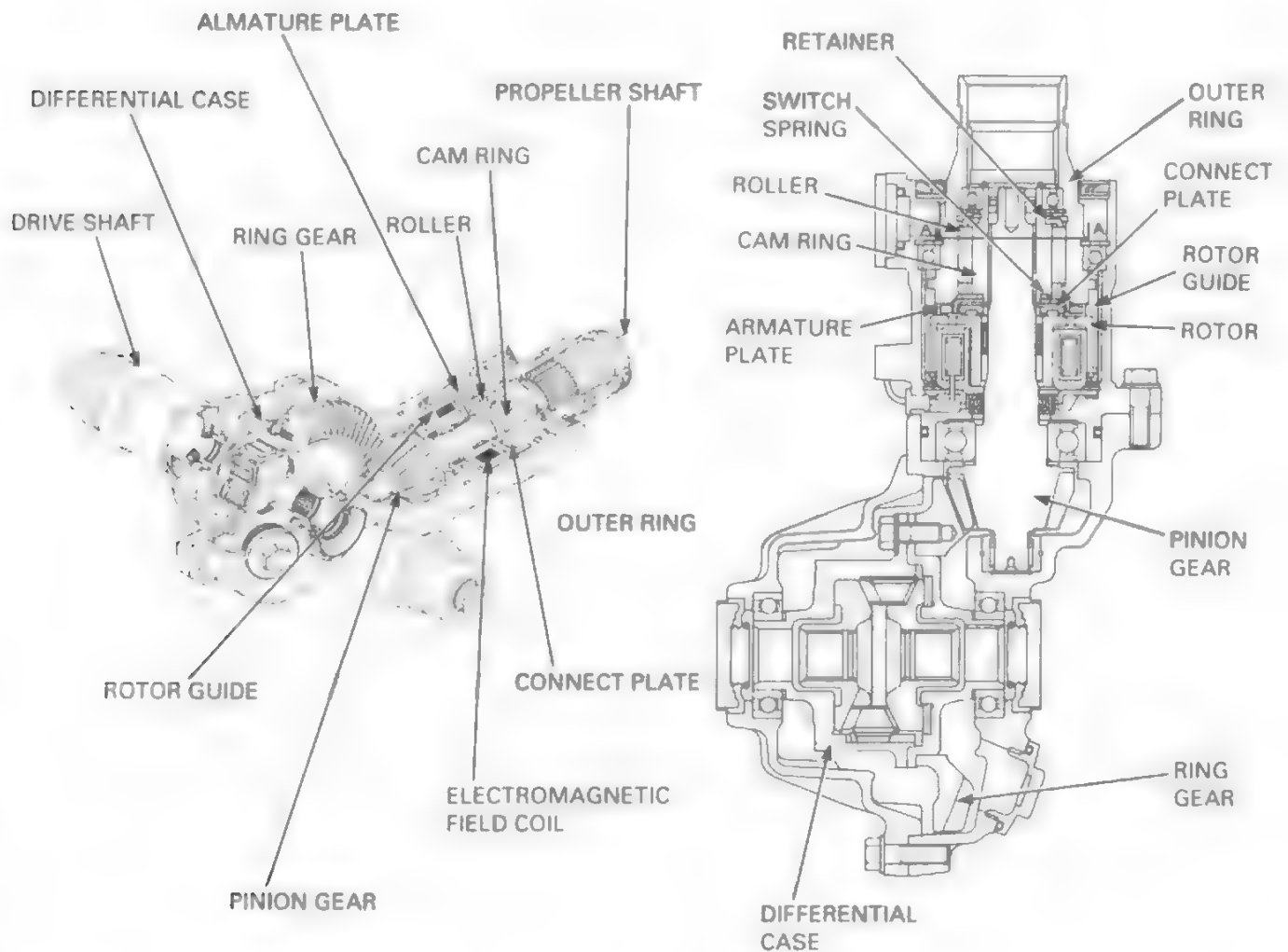
## SELECTABLE 4WD SYSTEM (After '01)

### CONSTRUCTION

This mechanism controls the selectable 4WD. The rider selects either 2WD or 4WD on the 2WD/4WD switch that is located on the right handlebar. Selection is possible when driving.

This compact mechanism is operated by an electromagnetic mechanical clutch (electro-magnetically activated bi-directional roller clutches) and drives a built-in front differential pinion gear.

This system provides for smooth and quiet operation. You can also shift smoothly between 2WD and 4WD.



## TECHNICAL FEATURES

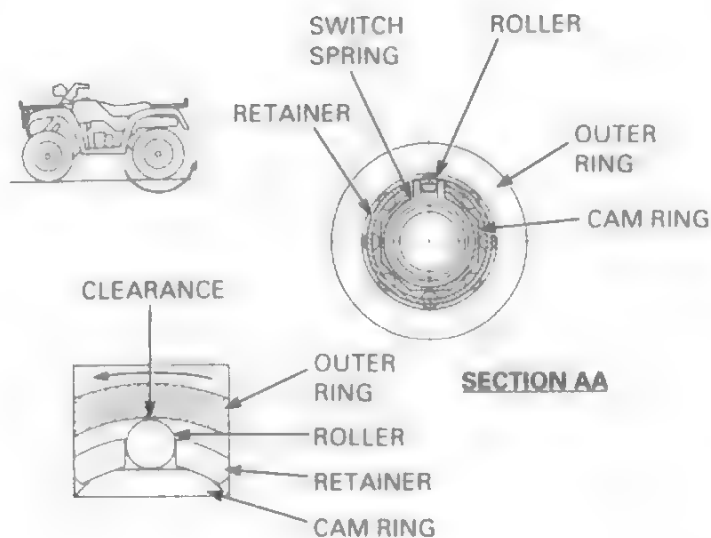
### OPERATION (at front differential)

#### 1. 2WD torque transmission:

Engine

Propeller shaft

Outer ring



#### 2. 4WD torque transmission:

When 4WD is selected, voltage is applied to the field coil. This creates a magnetic field that magnetizes the rotor. The magnetic force pulls the armature plate against the rotor and rotates the roller retainer. This moves the rollers from their center neutral position on the cam ring causing them to bind between the outer ring and the cam ring. This allows power to flow to the differential and front wheels.

When power to the field coil is switched off, the switch spring moves the roller retainer to the neutral position for 2WD operation.

Engine

Propeller shaft

Outer ring

Roller

Cam ring

Pinion gear

Ring gear

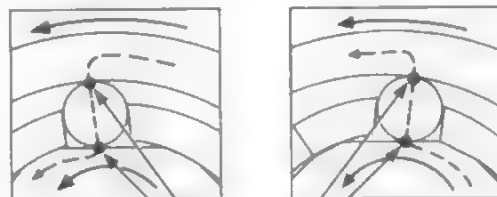
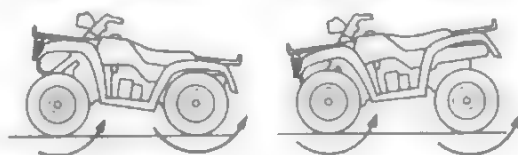
Differential case

Drive shaft

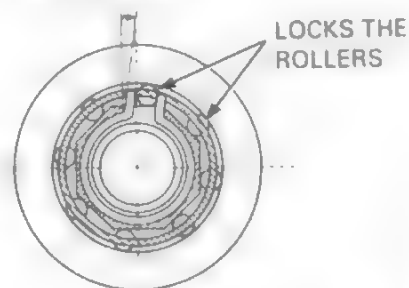
Front tires

#### ACCELERATION:

#### DECCELERATION:



PUSHING  
THE SWITCH SPRING AND  
THE RETAINER



SECTION AA

LOCK

# 25. TROUBLESHOOTING

**ENGINE DOES NOT START OR IS  
HARD TO START**

**25-1**

**POOR PERFORMANCE AT HIGH  
SPEED**

**25-4**

**ENGINE LACKS POWER**

**25-2**

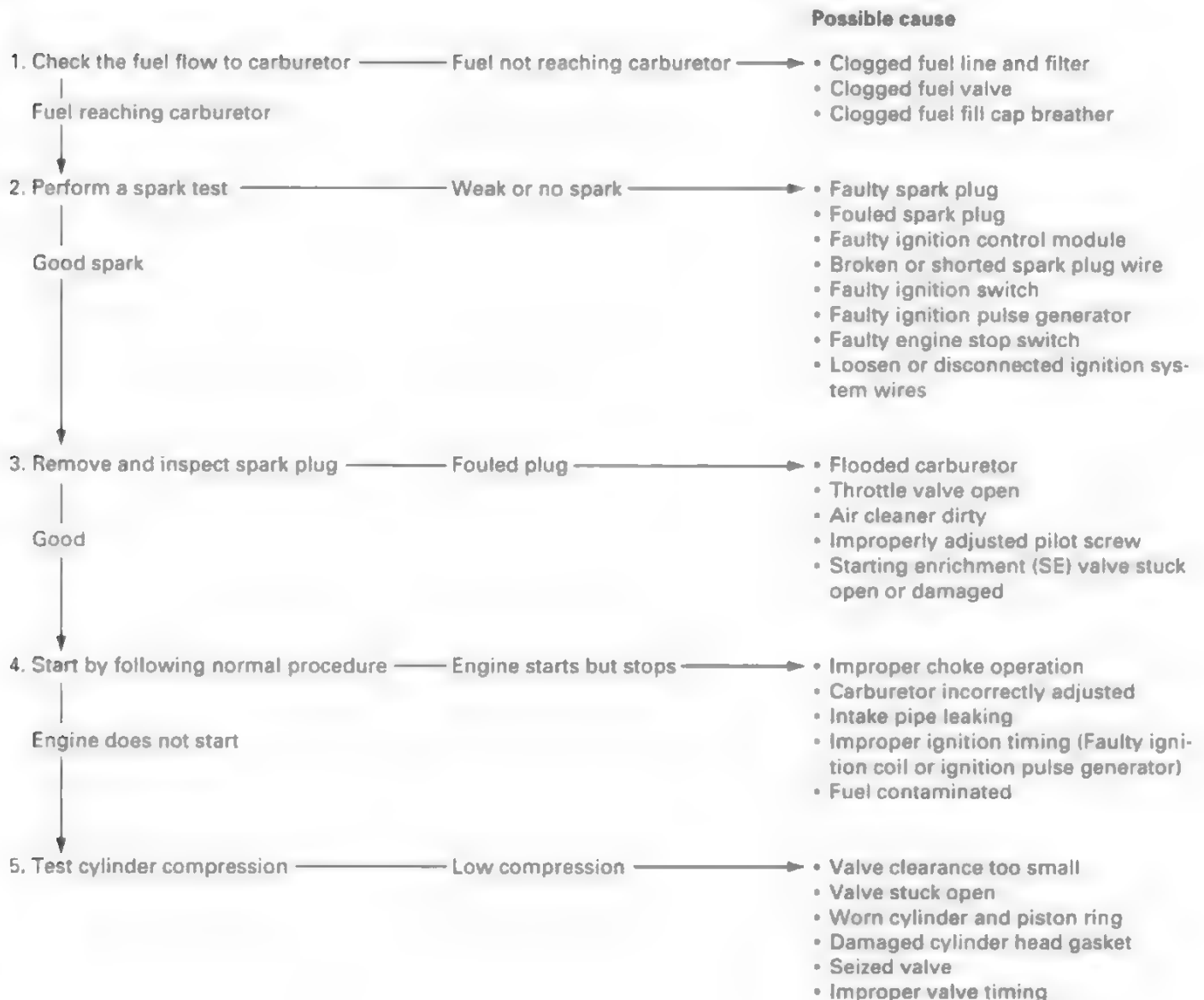
**POOR HANDLING**

**25-4**

**POOR PERFORMANCE AT LOW  
AND IDLE SPEED**

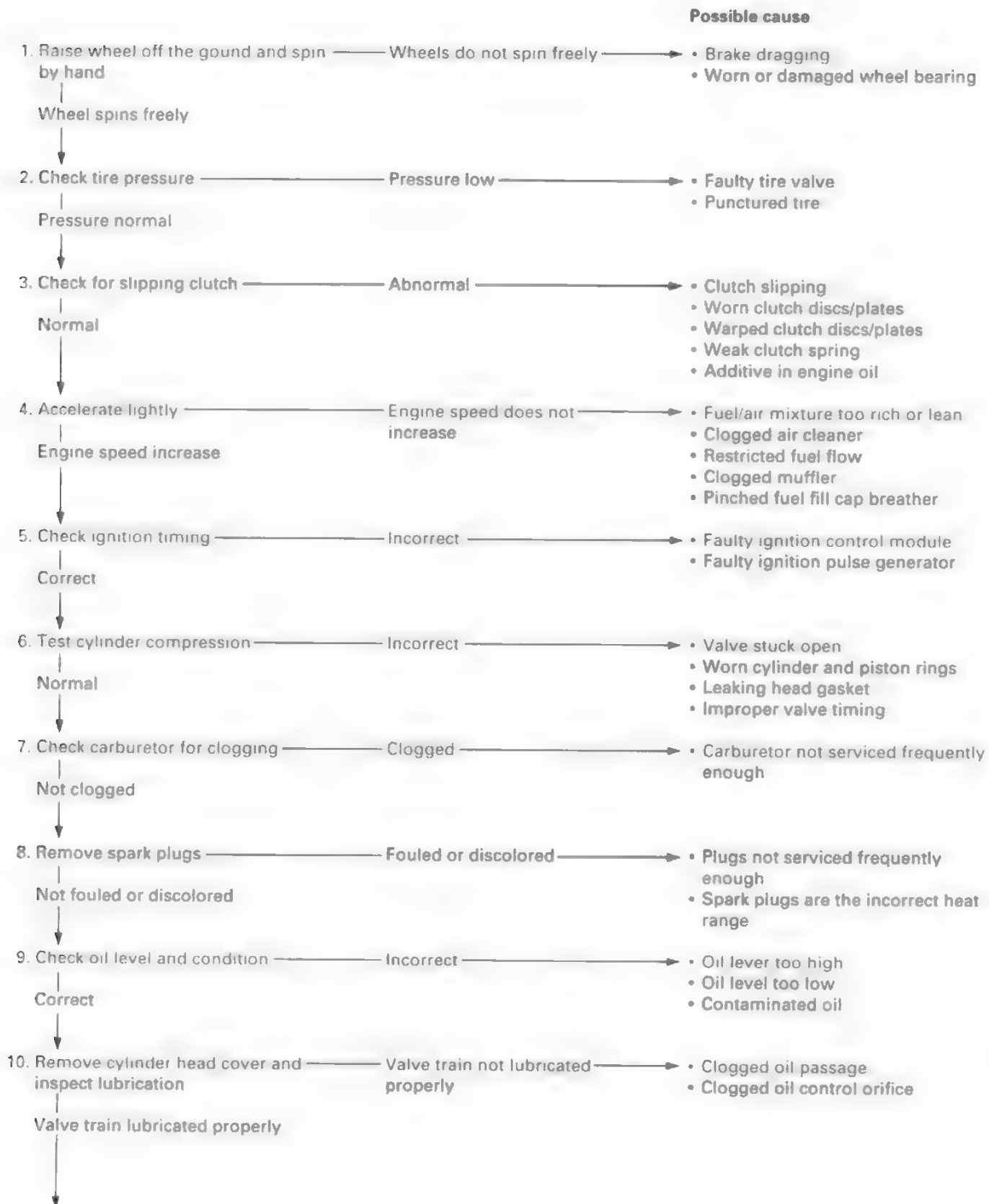
**25-3**

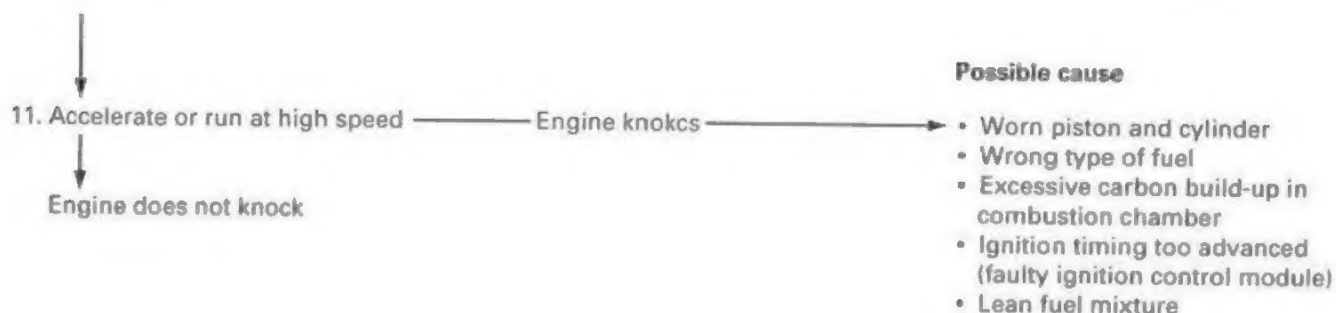
## ENGINE DOES NOT START OR IS HARD TO START



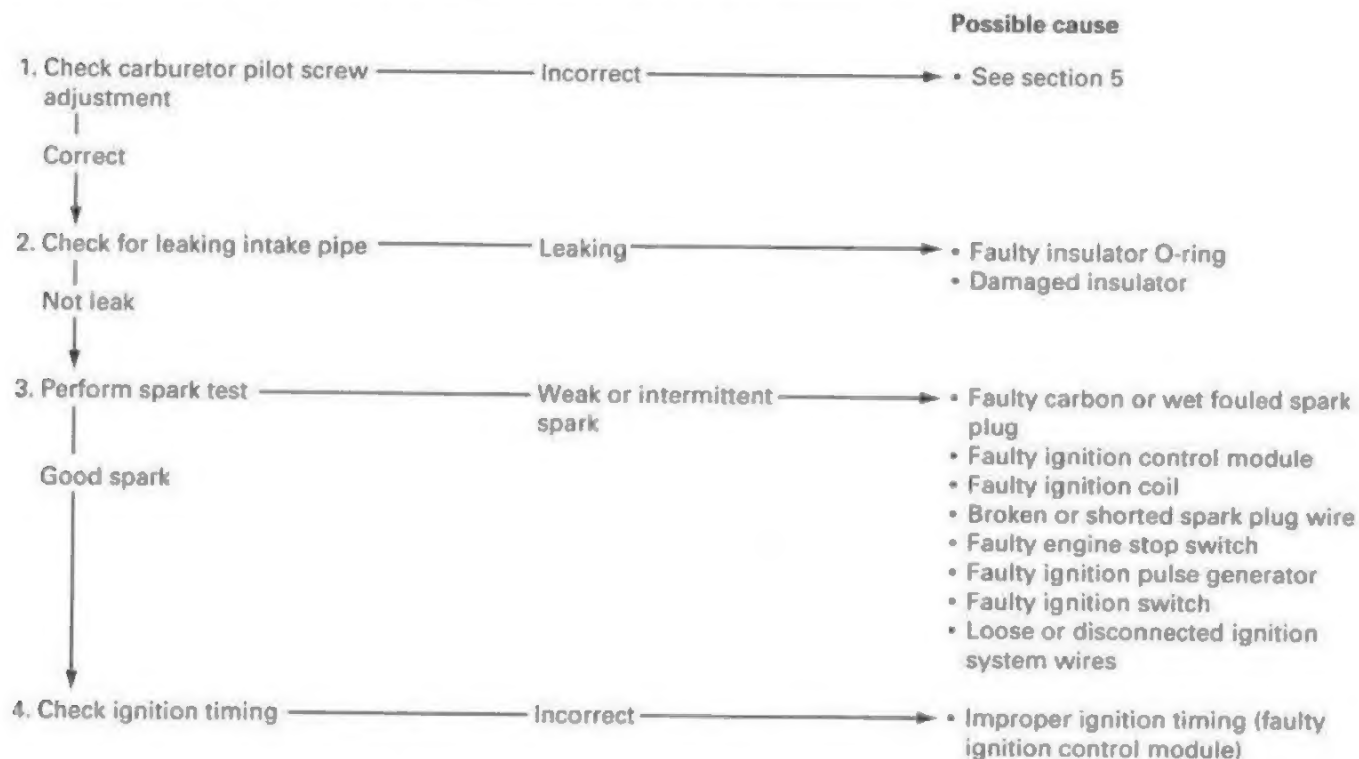


## ENGINE LACKS POWER

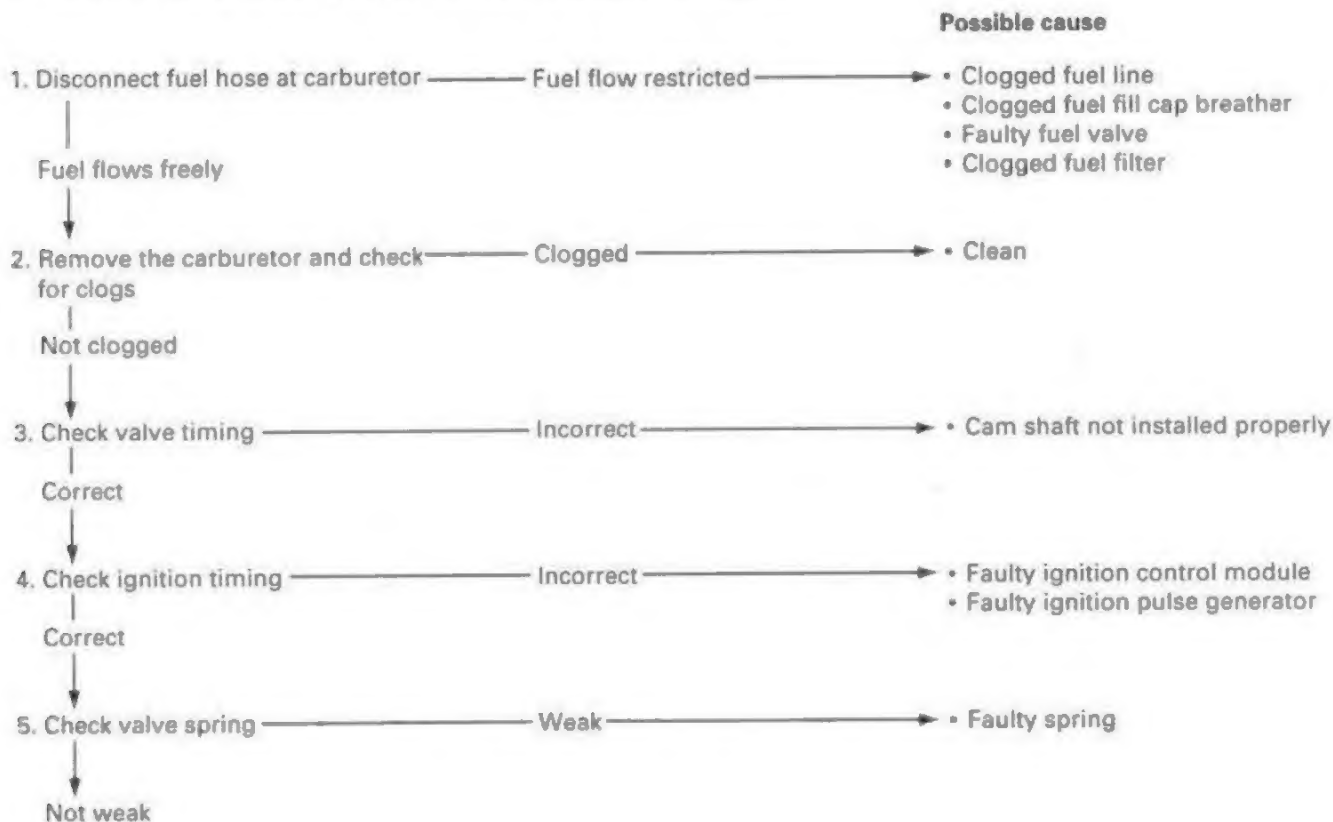




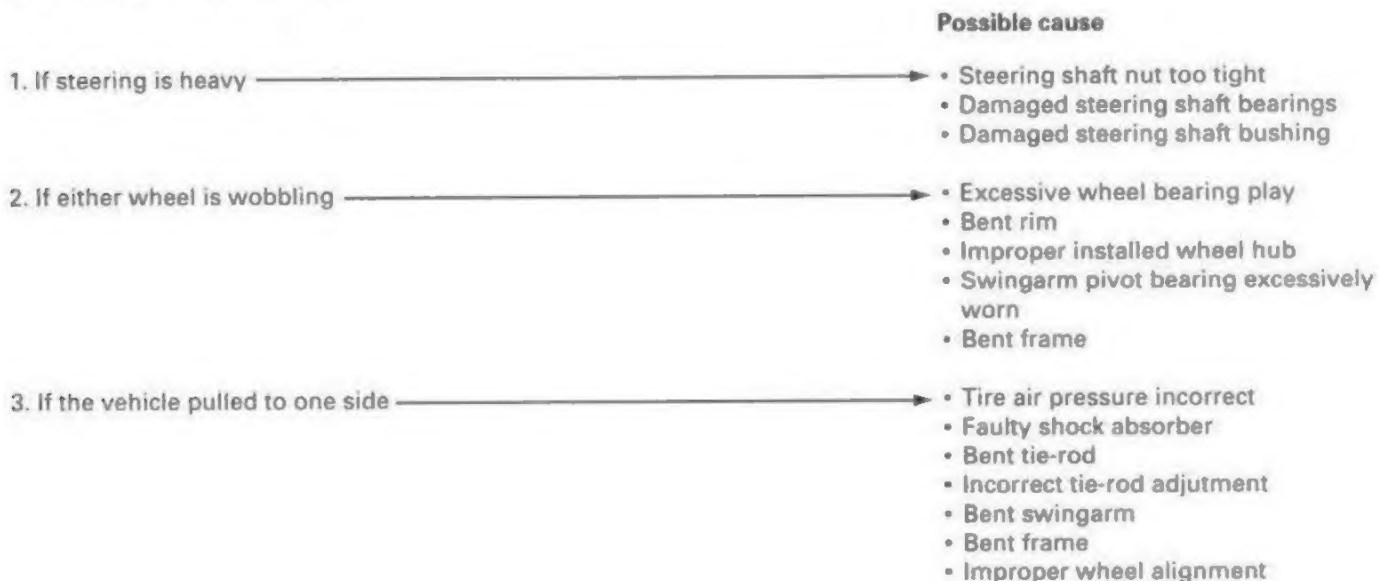
## POOR PERFORMANCE AT LOW AND IDLE SPEED



### POOR PERFORMANCE AT HIGH SPEED



### POOR HANDLING



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